CITY OF AKRON

LONG-TERM CONTROL PLAN '98

APRIL 7, 2000

Sept 5 2000
May 1 2002

SEPH P. KIDDER
Service Director

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May 28, 2002

Mr. Paul Novak, P.E.
Manager Permits & Compliance Section
Division of Surface Water, Ohio EPA
Lazarus Government Center
122 S. Front Street
Columbus, Ohio 43215-1099

Re: City of Akron
CSO Long Term Control Plan (LTCP)

Dear Mr. Novak:

As previously discussed, the City of Akron believes its submitted CSO LTCP complies with all applicable state and federal guidance and policy documents. At the request of Ohio EPA, Akron agreed to (1) conduct a further evaluation of express sewers for the major separate sewer areas upstream of combined sewer areas, (2) evaluate additional treatment at the proposed CSO facility for the Ohio Canal Tunnel, CSO Rack 40, Northside Tunnel and WPCS Secondary By-pass and (3) evaluate the proposed schedule based on the staging requirements of the various projects, constructability, water quality improvements and City of Akron sewer user rate financial analysis.

Please find attached the following proposed additions to the City of Akron Long Term Control Plan dated April 7, 2000 (modified September 5, 2000).

1. 2002 Long Term Control Plan, Additional Evaluations (Proposed Integrated Alternative #2).
   a. Express Sewers
   b. Enhanced High Rate Clarification (EHRC)
   c. Additional Treatment at WPCS
2. City of Akron LTCP – 30 Year Implementation Schedule with Additional Treatment (Yearly Increases Scenario)
3. City of Akron LTCP – 30 Year Implementation Schedule with Additional Treatment (Five Year Increases Scenario)
4. New Section 5.4

My staff looks forward to meeting with you on May 30, 2002 to discuss the enclosed revised pages. In the meantime, should you have any questions or need further information in advance of the meeting, please do not hesitate to call Patrick Gsellman at 330-375-2357.

Sincerely,

Joseph P. Kidder, Director
Department of Public Service

JPK/rc

Enclosures

c: Mayor Plusquellic
R. Bell w/enclosure
S. Cappotto
D. Celik
M. McGlinchy
P. Gsellman
J. Bronowski
G. Bozeka
File F-04
Environmental Division File

JOSEPH P. KIDDER
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December 24, 2001

Mr. Paul Novak, P.E.
Manager Permits & Compliance Section
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Lazarus Government Center
122 S. Front Street
Columbus, Ohio 43215-1099

Re: City of Akron
CSO Long Term Control Plan (LTCP)

Dear Mr. Novak:

As you know, the City of Akron has completed its review of your letter dated September 14, 2001. Moreover, we also met on November 29, 2001 in your office to discuss and clarify the issues in your letter and the provisions of the City's CSO Long Term Control Plan ("LTCP"). Needless to say, the City disagrees with several issues raised in your letter. Simply stated, it is the City's position that the CSO LTCP complies with all applicable state and federal guidance and policy documents. While the parties have discussed these issues on several occasions, the City intends to provide a written response to these issues on February 28, 2002.

Despite the fact that Akron disagrees with the issues raised in your letter, Akron is willing to conduct the additional evaluations that have been requested by Ohio EPA, and which are noted below. Please keep in mind that by agreeing to perform these additional evaluations, Akron does not admit that its current CSO LTCP is in any way deficient. Specifically, Akron agrees to conduct the following:

1. A Further evaluation of express sewers for the major separate sewer areas upstream of combined sewer areas. This will pertain to CSO Rack 18, Northside Sewer areas, and CSO Racks 11 and 12.

2. Evaluation of additional treatment at the proposed CSO facilities for the Ohio Canal Tunnel, CSO Rack 40, Northside Tunnel and WPCS Secondary Bypass.

3. Evaluation of the proposed schedule. The schedule length will be based on the staging requirements of the various projects, constructability, water quality improvement and City of Akron financial capabilities as related to sewer user rates.

At this time, we propose to submit the express sewer and additional treatment tasks (1 and 2 above), including planning costs and present worth calculations, on or before February 28, 2002. The water quality modeling efforts will be completed in March 2002.

Upon receipt of Ohio EPA's comments (if any) on the above submittal (1 and 2 above), we anticipate it will take approximately 30 days to re-evaluate the proposed schedule (3 above). The re-evaluation of the schedule and its submittal date, are dependent on Ohio EPA's review of items 1 and 2.

It is important to note that throughout the review process, Akron has, and will continue to implement items in the CSO LTCP. The following are examples of CSO control projects implemented by Akron. First, Akron continues to update and implement the previously submitted Nine Minimum Controls. Moreover, the sewer separation for Rack 39 (elimination of CSO 39) has been completed. The design of the sewer separation Rack 9 (elimination of CSO 9) is near completion with construction scheduled for summer of 2002. The proposed 2002 Capital Improvement Budget includes Sanitary Sewer Reconstruction, Sewer System I/I Correction, Nine Minimum Control Improvements, Miscellaneous Sewer Separations, and reconstruction of a portion of the Little Cuyahoga Interceptor. The City has also started a multi-year evaluation of sewer-river crossings. In addition to the above, Akron continues to monitor the sewer system at a significant expense, including a rain gauge network, flow monitoring and a hydraulic/water model.

Finally, Akron continues to seek funding from all possible sources. Akron will be receiving grants of $1,000,000 for CSO improvements and $485,000 for improvement to the Cuyahoga Valley National Park. The House and Senate Conference Report on the VA-HUD FY 2002 Appropriations Bill (HR 2620 and S1216) was approved on November 8, 2001. The legislation includes funding for the Environmental Protection Agency, the National Science Foundation and the Federal Emergency Management Agency. Included in this Bill is an appropriation to the City of Akron of $1,000,000 for continued work on the combined sewer system and $485,000 for a project that would result in improvement to the Cuyahoga Valley National Park. The City greatly appreciates the support of Ohio EPA in Akron's efforts to obtain these funds.

If you have any questions or require any further information, please contact Patrick D. Gsellman at 330-375-2357.

Sincerely,

Joseph P. Kidder, Director
Department of Public Service

JPK/PDG/ag TC 12/27/02

c: Mayor Plusquellic, D. Celik, J. Bronowski, D. Crandell, M. McGlinchy, R. Bell, S. Cappotto, File F-04, Environmental Division File

2001-12-24 cso lotcp jpk pdg ag

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September 5, 2000

Ms. Sandra Cappotto
Environmental Scientist
Division of Surface Water
Ohio EPA, Northeast District Office
2110 E. Aurora Road
Twinsburg, Ohio 44087-1969

Re: Modifications to City of Akron Long-Term Control Plan

Dear Ms. Cappotto:

During the July 19, 2000, meeting, the City of Akron agreed to make three separate modifications to its April 7, 2000, Long-Term Control Plan ("LTCP"). These modifications are enclosed for your consideration. While we plan to discuss these modifications with you during the meeting scheduled for September 8, 2000, below is a brief overview.

The first modification pertains to the calculation used for determining the percentage of flow that will be captured for treatment. For the sake of clarity, the LTCP has been significantly revised regarding this calculation. This revised information is set forth in pages 4-15 through 4-21, and replaces existing pages 4-15 through 4-16. As a result, the calculation should be easier to comprehend, and it should be easier for a reader to readily determine that the required demonstration has been made.

At your request, a detailed bar chart, enclosed as figure 5-3, was also prepared. This chart identifies the time frames for initiation of design, initiation of construction and completion of construction for each of the projects identified in Table 5-1. This chart demonstrates that the projects will overlap in time during design and construction. Obviously, the time frames set forth in the enclosed bar chart are subject to a timely approval of the LTCP.

Finally, we have also revised the text regarding the City of Akron's financial commitment to implement the projects identified in Table 5-1. The revised text, which is enclosed for your consideration, appears on revised pages 5-7 through 5-8, and replaces existing pages 5-7 through 5-8.

In addition to providing you with the enclosed modifications, this letter is also intended to respond to a comment made by Mr. Bell regarding the City of Akron's collection system. Specifically, Mr. Bell suggested the possibility that large portions of the combined sewer system could be considered a separate sanitary system. In support of this statement, Mr. Bell suggested that we check the arguments made by the U.S. EPA in the enforcement actions filed against the City of Toledo and City of Youngstown. As a result of an extensive search of the pleadings and decisions in those cases, we can find no evidence to support the position articulated by Mr. Bell. More importantly, the definitions provided within U.S. EPA's CSO policy clearly support the City of Akron's position regarding the nature of its sewer system and the CSO's. Specifically, "combined sewage" is defined as wastewater and storm drainage carried in the same pipe. Moreover, "combined sewer" is defined as a sewer designed to carry wastewater and storm water run-off. Based upon these definitions, the City of Akron's main outfall sewer is a combined sewer that carries combined sewage. Moreover, all of the overflow points in the system are on combined sewers carrying combined sewage. Simply stated, the overflow events only occur during wet weather situations.

We look forward to meeting with you on September 8, 2000, to discuss the enclosed revised pages. In the meantime, should you have any questions or need further information in advance of the meeting, please do not hesitate to call Patrick G. Gsellman of my staff at (330) 375-2357.

Sincerely,

Joseph P. Kidder, Director
Department of Public Service

JPK/JJB/pkp

Enclosure

c: D. Celik, D. Crandell, P. Gsellman, G. Bozeka, J. Bronowski, File F-04, File F-02, Environmental Division File

2000-09-05 cappotto oepa modifications to long-term control plan

JEFF Bmp0003151

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July 10, 2000

Ms. Sandra M. Cappotto, Environmental Scientist
Division of Surface Water
Ohio EPA, Northeast District Office
2110 East Aurora Road
Twinsburg, OH 44087-1969

Re: City of Akron
CSO Long Term Control Plan

Dear Ms. Cappotto:

The purpose of this letter is to provide Ohio EPA with the information that was requested in your letter of May 25, 2000 concerning Akron's Long Term Control Plan ("LTCP"). For the sake of convenience, the information set forth below is provided in the same order as requested in your letter; i.e., a summary of the data justifying the calculated 94% flow capture, additional information supporting the prioritization of the projects set forth within the LTCP, and confirmation of Akron's financial commitment for the implementation of the LTCP. In the event that Ohio EPA has any additional questions with regards to the LTCP, we would be more than willing to meet with you and other representatives of the Ohio EPA to address the same.

I. Demonstration of the 85% Capture

The CSO Policy states the following about the Presumption Approach:

"*The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis...*"

For the calculations of Akron's Annual Percent Capture, the following were assumed.

- "Treatment" is defined as flows that receive at least primary treatment.
- Combined sewage is any flow that is a mixture of stormwater and sanitary flow.
- A "precipitation event" occurs when inflow to the WPCS exceeds the average daily flow.

We used the following for the definition of Annual Percent Capture:

$$\text{Percent Capture} = \frac{V_{CFT}}{V_{TOTAL}}$$

Where,

V_{CFT} = Volume of flow "Captured for Treatment (CFT)". This shall include all influent to the WPCS (including secondary bypass) and all treated overflow from Treatment Basins in Alternative 2.

$V_{OVERFLOW}$ = the annual sum of all the untreated overflows from the combined sewer system including the basins and tunnels in Alternative 2. The untreated overflow volume from each control structure was tracked during the model runs (summaries in Table 12-4 in Facilities Plan '98 Alternatives).

$V_{TOTAL} = V_{CFT} + V_{OVERFLOW}$

V_{CFT} was calculated as follows:

Figure 1 shows a model generated inflow hydrograph at the WPCS. The flow data is given in hourly time steps (Δt = 1 hour). At each time step, the WPCS inflow rate, Q_i, was checked against the daily average flow rate of 76.5 MGD[1] (118.4 cfs). This daily average flow rate was taken from the 1998 Akron Facilities Plan. If the WPCS inflow was higher than the average daily flow rate, a precipitation event is said to be occurring and an incremental volume was calculated:

$$V_i = Q_i \times \Delta t$$

The incremental volumes were summed for the entire year to give the total treated volume during times when inflow was above average (and thus "during precipitation events").

For Alternate #2:

V_{CFT} = 7,257 Mgal

$V_{OVERFLOW}$ = 454 Mgal

V_{TOTAL} = 7,257 + 454 = 7,711 MGal

Breakdown of the 7257

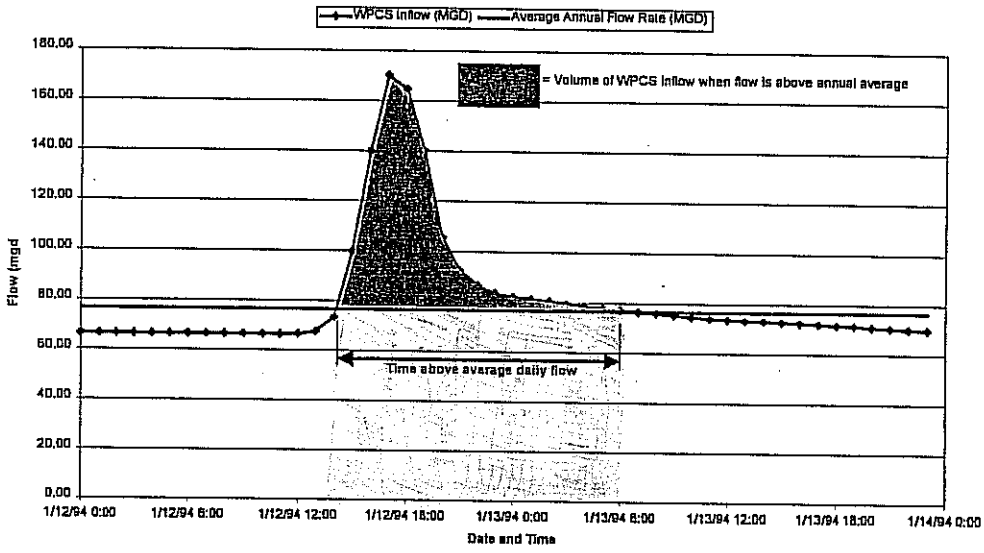
Percent Capture = 7,257/7,711 = 94%[2]

The modeled flows for Alternative 2 can be found on Table 4-2 of the LTCP.

[1] 76.5 MGD was the modeled average daily flow for the typical 1994 year at WPCS. This value is above the average daily dry weather inflow shown on ~~Table 2-2~~ of the 4/7/2000 submittal because it is an average of dry and wet weather inflows to WPCS.

[2] The City's Long Term Plan includes an additional 40 Million Gallons of storage at WPCS which was not included in the 94% capture calculation. The storage is provided to reduce secondary bypass and allow a greater amount of flow to receive full treatment.

Figure 1. Calculation of Treated Volume When Inflow to WPCS Above Annual Average



II. Prioritization

The group of projects set forth in Alternative 2 of the LTCP was selected because it was determined to be the environmentally, technically and economically best method for addressing the CSO's within the City of Akron's combined sewer system. After selecting these projects, the schedule in Chapter 5 was developed for the purpose of implementing these projects in a manner that would effectively and efficiently address the CSO's. Consistent with the provisions of the Ohio and federal CSO policies cited within the LTCP, the schedule is intended to address some of Akron's legitimate financial concerns. However, contrary to the statements set forth within your letter, the schedule is not "based solely upon financial capabilities . . . ." Rather, important environmental and technical aspects were strongly considered during the development of the schedule including but not limited to impacts to sensitive areas. (See Section 3 of LTCP)

It is suggested in your letter that the Northside Interceptor Tunnel ("NSI") project should be implemented earlier in the schedule. However, the data clearly demonstrates that the Ohio Canal Interceptor (OCI) Tunnel will provide the most significant benefits as to reducing the impacts from the CSO's. (*See Chapter 5, page 5.4 and Tables 4-2 through 4-5.*) Moreover, the CSO's that will be controlled by the OCI discharge into the canal, which in turn discharges into important water bodies, i.e. the Little Cuyahoga River, Cuyahoga River. Given the substantial reduction in volume, events, hours and CBOD loadings that will result from the implementation of the OCI Tunnel, and the associated reduction of the potential impacts to the Little Cuyahoga and Cuyahoga Rivers, the OCI Tunnel was determined to be more environmentally beneficial when compared to the NSI.

In addition to the above, it is important to keep in mind the environmental, technical and engineering considerations regarding the implementation of all of the projects set forth in years 1 through 11. It is necessary to implement these additional projects prior to implementing the OCI or NSI projects. One of the two 20 MG storage basins at WPCS is required before either the OCI

or NSI to avoid increased WPCS secondary bypass that would cause additional volume and CBOD loadings to the Cuyahoga River in the CVNRA. The CVNRA, like the Cascade and Gorge Metropolitan Park areas is a State resource water as delineated in Chapter 3 of the LTCP. In fact, the 40 MG of additional WPCS retention basins, even with a greater capture and transport to the WPCS of combined sewerage, will reduce the secondary bypass and allow a greater amount of flow to receive full treatment than now occurs. These considerations are summarized in the following table. The corresponding reductions that are expected to be achieved are set forth in Tables 4-2 thru 4-5 of the LTCP.

Major Projects (in order of staging)	Reason for Prioritization	Important Waters Impacted SRW = State Resource Water PCR = Primary Contact Recreation
CSO Rack #40/31	- largest CSO by volume - largest storage basin - located on the Main Outfall - allow for flow maximization - high priority with Ohio EPA - needed so that other projects will not have an adverse effect on CSO. - gain experience with storage technology prior to design of other storage basins.	Cuyahoga Valley National Recreation Area (SRW & PCR) Cuyahoga River, American Heritage River (SRW & PCR) Little Cuyahoga River (PCR)
CSO Rack #26/28	- largest treatment basin -gain experience with treatment technology prior to design of other treatment basins	Cuyahoga Valley National Recreation Area (SRW & PCR) Cuyahoga River, American Heritage River (SRW & PCR) Little Cuyahoga River (PCR)
WPCS Storage Phase I	- needed prior to OCI or NSI in order to not increase secondary by-pass - allows a greater amount of flow to receive full treatment	Cuyahoga Valley National Recreation Area (SRW & PCR) Cuyahoga River, American Heritage River (SRW & PCR)
OCI Tunnel	- largest tunnel project - provides the most significant reductions in flow and load	Cuyahoga Valley National Recreation Area (SRW & PCR) Cuyahoga River, American Heritage River (SRW & PCR) Little Cuyahoga River (PCR)
WPCS Storage Phase II	- needed prior to NSI tunnel and individual basins in order to not increase secondary by-pass	Cuyahoga Valley National Recreation Area (SRW & PCR) Cuyahoga River, American Heritage River (SRW & PCR)
NSI Tunnel	- remove CSOs from State Resource Waters and Gorge and Cascade Valley Metro Park	Cuyahoga Valley National Recreation Area (SRW & PCR) Cuyahoga River, American Heritage River (SRW & PCR) Gorge and Cascade Valley Metropolitan Parks (SRW & PCR)

Finally, while the data clearly supports the technical and environmental benefits of the schedule proposed in Chapter 5, Akron is more than willing to meet with Ohio EPA and further discuss these benefits and the order of implementation, in greater detail.

III. Financial Commitment

As part of developing its LTCP, the City of Akron evaluated several funding mechanisms. This includes, but is not limited to, its existing source of revenue. The LTCP contains the level of financial commitment required under the Ohio and federal CSO Policies. Akron will commit to "aggressively pursue financial arrangements" for the implementation of the projects identified within the Long-term Control Plan.

Consistent with the policy provisions that are cited in the LTCP, the City of Akron has proposed that the projects should be implemented as part of several successive five-year permits. Thus, the City of Akron, consistent with the federal and Ohio CSO policies, has recommended a mechanism for the implementation of the projects. At the same time, and consistent with the expressed provisions of Ohio's CSO Policy, this compliance method will "allow for periodic reassessment of subsequent projects to consider new or improved control technology and to consider new information that may allow the appropriate water quality standards to be achieved using more cost effective controls." Likewise, given the cost of the controls, funding options will also have to be continually evaluated.

It is important to note that Akron has also demonstrated its financial commitment through its past and present actions. Akron has already spent millions of dollars to study the CSO's and to implement controls to reduce the associated impacts.

Finally, it must be pointed out that the City of Akron has proposed a LTCP that will cost more than $248,000,000.00 to implement. (This is in addition to the millions that Akron has already spent to date to study, address, and reduce CSO's, and the $25 million spent to eliminate SSO's.) Obviously, it is not possible from an economic or technical standpoint to implement these projects overnight. Rather, it will take several years to complete the implementation. The successful implementation of CSO controls will depend upon the joint co-operation and coordination between the City of Akron and Ohio EPA.

If you have any questions or would require any further information, Please contact Patrick Gsellman, P.E., Environmental Division Manager at (330) 375-2357.

Sincerely,

Joseph P. Kidder, Director
Department of Public Service

attachment

C: Mayor Plusquellic, D. Celik, D. Crandell, P. Gsellman, G. Bozeka, File F-04, Environmental Division File

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April 7, 2000

Ms. Sandra M. Cappotto, Environmental Scientist
Division of Surface Water
Ohio EPA, Northeast District Office
2110 East Aurora Road
Twinsburg, OH 44087-1969

Re: Facilities Plan Update (Long Term Control Plan)

Dear Ms. Cappotto:

Please find enclosed for your review and approval a report summarizing the Akron Facilities Plan CSO Long Term Control Plan (LTCP) as required by the Ohio Environmental Protection Agency (EPA) Director's Final Findings and Orders for Ohio EPA Permit Number 3PF00000*FD, issued August 5, 1994, effective September 20, 1994.

The Facilities Plan 98, Appendices, Alternatives, and the Alternative Selection were previously provided to the Ohio EPA. In the event that you need additional copies, please contact the City.

A portion of the program funding will be used to develop and implement an environmental awareness and education program. The City plans to work with the current Technical Advisory Group to develop a work plan for this purpose.

Please contact Patrick Gsellman, P.E., Environmental Division Manager, at your convenience at (330) 375-2357 to discuss the project.

Sincerely,

Joseph P. Kidder, Director
Department of Public Service

JPK/PDG/kbs

Enclosure

c: Mayor Plusquellic, C. D. Haugh, D. Crandell, M. McGlinchy, J. Bronowski, G. Bozeka, File F-4, Environmental Division File

2000-04-07 cappotto facilities plan update ltcp jpk pdg kbs.doc

CITY OF AKRON

LONG-TERM CONTROL PLAN '98

APRIL 7, 2000

Revised

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TABLES

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FIGURES

1.0 INTRODUCTION

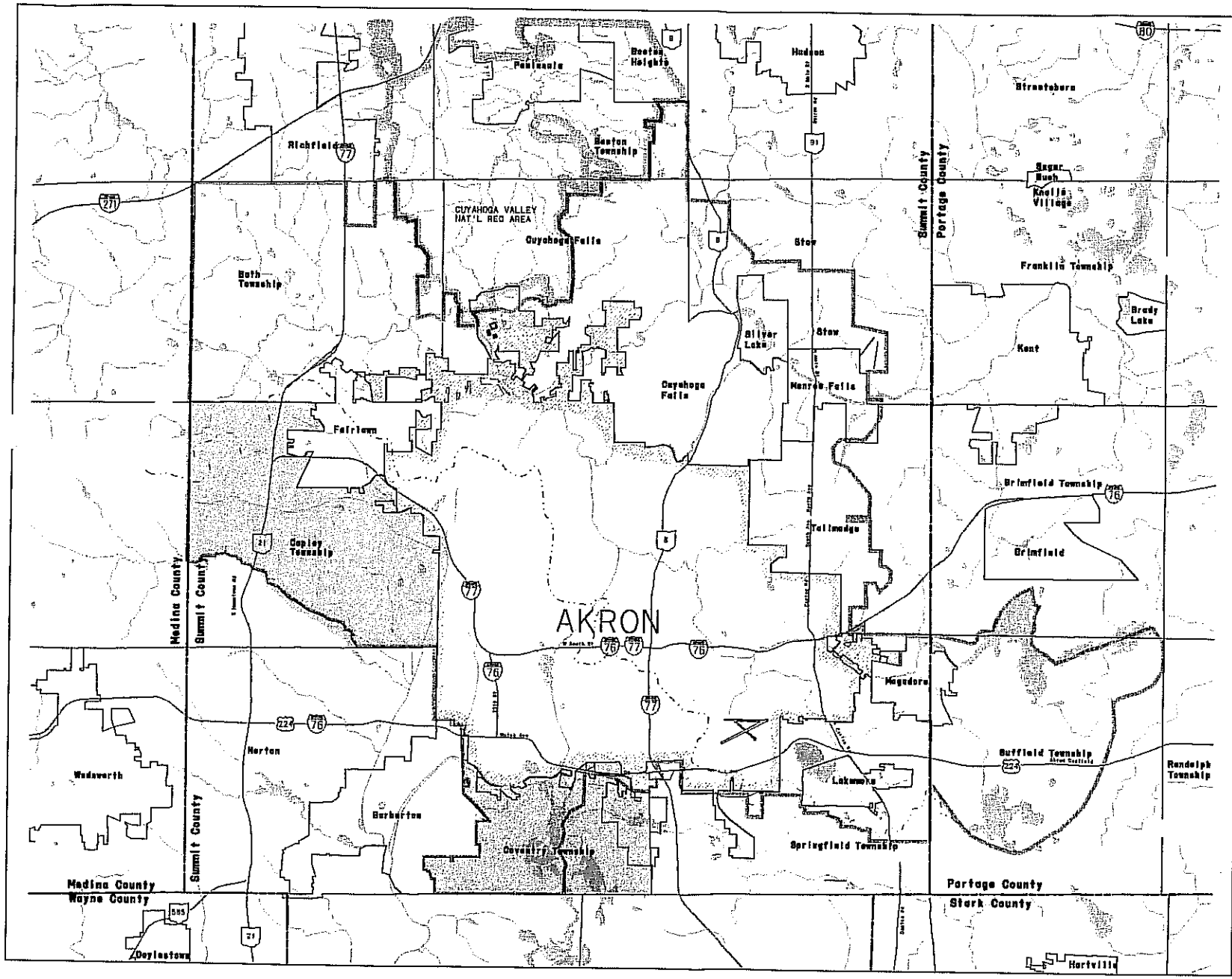
1.1 Study Purpose and Scope

The combined sewer overflow (CSO) long-term control plan for the City of Akron sanitary sewer system is mandated by the Ohio Environmental Protection Agency (EPA) as part of the Director's Final Findings and Orders (DFFOs) for Ohio EPA Permit No. 3PF00000*FD, issued August 5, 1994, effective September 20, 1994. The DFFOs specify that the City of Akron must prepare a revised facilities plan (Facilities Plan '98) and a CSO long-term control plan (Long-Term Control Plan '98). In accordance with the United States EPA (USEPA) CSO Control Policy, a long-term CSO control plan identifies selected CSO control measures that, when implemented, will ultimately result in compliance with the requirements of the Clean Water Act.

Facilities Plan '98 was developed to update information presented in the 1980 Facilities Plan and has been submitted to the Ohio EPA for review. The Long Term Control Plan '98 was developed as a comprehensive CSO control plan that recognizes the site-specific nature of CSOs and their impacts on receiving water bodies, and includes water quality based control measures that are technically feasible, affordable, and are consistent with the USEPA CSO Control Policy. The CSO long-term control plan presented in this document shall serve as the basis for future CSO projects involving new, expanded, upgraded, or rehabilitated wastewater facilities. Components of the Long-Term Control Plan '98 were included as part of Facilities Plan '98 and have also been submitted to the Ohio EPA for review.

This document shall serve as the City of Akron's CSO long-term control plan summary and addresses the following nine elements:

- Characterization, Monitoring, and Modeling;
- Public Participation;
- Consideration of Sensitive Areas;
- Evaluation of Alternatives;
- Cost/Performance Considerations;
- Operational Plan;
- Maximization of Treatment at the Water Pollution Control Station;
- Implementation Schedule; and
- Post-Construction Compliance Monitoring Program.



AKRON FACILITIES PLAN '98

FIGURE 2-1

LONG-TERM CONTROL PLAN PLANNING AREA

2.0 CHARACTERIZATION OF THE COMBINED SEWER SYSTEM

2.1 Introduction

The characterization of the combined sewer system (CSS) is described as the evaluation of the existing sewer system through the analysis of existing monitoring and modeling data from the combined sewer and receiving water systems. The objective of this evaluation is to develop a detailed understanding of the current conditions of the combined sewers and receiving waters within the planning area. This assessment establishes the baseline conditions and determines receiving water goals and priorities for the Long-Term Control Plan '98. The computer models developed as part of this project were essential in determining the design of alternatives and the impact the alternatives have on the receiving waters.

2.2 Planning Area

The planning area for the Long-Term Control Plan '98 is presented on Figure 2-1. The planning area covers approximately 167 square miles and includes most of the Akron metropolitan area. There is a population of 352,000 in the service area, and includes all or portions of 5 cities, 4 villages, and 7 townships.

Even with the addition of the new Joint Economic Development Districts, the current planning area has decreased from the 1980 Akron Facilities Plan level due to expansion of other wastewater collection systems in the area.

Facilities Plan '98 Chapter 2 and Chapter 10 contains a detailed discussion of the planning area and its population projections.

2.3 Description of Existing Sanitary Sewer System

The collection system contributing to the Akron Water Pollution Control Station (WPCS) is the largest system within the Akron facilities planning area. The system includes approximately 1,165 miles of sewers consisting of 638 miles of separate sanitary sewers, 246 miles of storm sewer, 188 miles of combined sewers and 93 miles of inlet lead connections. The collection system, encompassing approximately 94 square miles, serves the City of Akron, City of Cuyahoga Falls,

City of Fairlawn, Village of Lakemore, Village of Mogadore, Village of Munroe Falls, Village of Silver Lake and parts of the City of Stow, City of Tallmadge, Bath Township, Copley Township, Coventry Township, and Springfield Township. The area served by each sewer district are contained in Table 2-1.

TABLE 2-1

Sewer Districts Tributary to the Akron Water Pollution Control Station

District Name	1998 Facilities Plan	1980 Facilities Plan
	Area Served (sq mi)	Area Served (sq mi)
Camp Brook, Tallmadge	7.0	6.6
Cuyahoga, Little Cuyahoga	16.3	14.5
Cuyahoga Falls, Northside Interceptor	8.1	8.3
Fairlawn	4.1	3.8
Hawkins	8.8	7.4
Lakemore, Springfield	5.9	4.2
Mogadore, Roosevelt Ditch	7.0	6.5
Mud Run	5.6	4.7
Mud Brook	18.6	11.2
Willow Run	9.1	8.7
Wolf Ledges	3.3	2.8
TOTALS	**93.8**	**78.7**

The entire portion of the system within the boundaries of Fairlawn, Mogadore, and Munroe Falls, and portions of the system within Cuyahoga Falls, Silver Lake, Stow, and the Townships of Bath, Copley, Coventry, and Springfield are maintained by the Summit County Department of Environmental Services. The City of Akron maintains its system and portions of the systems in Bath, Copley, Coventry, and Springfield Townships. The other municipalities are responsible for the system within their jurisdictional boundaries.

Wastewater flow from five different communities, including Cuyahoga Falls, Fairlawn,

Lakemore, Summit County and Tallmadge, are monitored on a continuous basis to record flow rate/volume and associated pollutant concentrations. The current and projected flows from the various districts are shown in Table 2-2. The data in the table separates the district dry weather flows into four subgroups: residential, commercial, industrial, and inflow/infiltration. A total flow of 170 gallons per capita per day was used for the current plan to project flows. This value is approximately equal to the average planning area flow determined by dividing the current planning area population by the average influent flow at the Akron WPCS.

Many of the early sewers were constructed as a combined system in what is now the central portion of Akron. A separate sewer policy was adopted in 1923. By 1931, the system had been expanded to include approximately 644 linear miles of sewer or 55 percent of the present system. Standard pipe units prior to 1931 included 2-foot lengths with hot poured asphalt and mortar joints.

Expansion of the system between 1931 and 1951 included the addition of 103 linear miles of sewer. The predominant pipe length during this period was 3 feet with oakum and die cast joints. Between 1952 and 1964, when the City of Akron specified premium joint pipe, about 285 linear miles of sewer were added to the system. This represents 24 percent of the present system. The pipe varied in length from 4 to 8 feet and joints included die cast and premium. Between 1965 and 1978, approximately 104 linear miles of sewer were added to the system. This consisted of 5½- to 8-foot pipe lengths with premium joints. From 1979 to the present, approximately 29 linear miles of sewer has been added, consisting of predominantly 8-foot pipe lengths with premium joints. This covers the period between the original and current facilities planning efforts, and represents an increase of approximately 2 percent over the last 2 decades. The larger sewers in the system were constructed of two and three ring brick, segmented block and concrete during all of the periods described.

There are approximately 23,750 manholes in the Akron system. These consist predominately of brick construction. Additional system appurtenances, which are maintained by the City of Akron, include 38 CSOs, 30 pump stations, 11 permanent master meters, and 5 recently constructed stream monitoring stations (which bracket the CSO area).

There are 38 CSOs within the City of Akron. Information on the CSOs is presented in Table 2-3. To monitor the effects of the CSOs on the receiving streams, the City of Akron has constructed monitoring stations at key points along the receiving streams. The location of each station was

TABLE 2-2

Estimated Existing and Future Dry Weather Flows by District

District	1996 - Flow (mgd)									
	Res.	%	Com.	%	Ind.	%	I&I	%	TOTAL	%
Cuyahoga/Little Cuyahoga	7.44	37.6%	1.30	6.6%	3.61	18.2%	7.46	37.6%	19.81	100.0%
Cuyahoga Falls/NSI	1.68	29.4%	0.33	5.9%	0.33	5.9%	3.37	58.9%	5.72	100.0%
Fairlawn/Montrose	0.50	23.2%	0.17	7.7%	0.01	0.3%	1.47	68.8%	2.14	100.0%
Hawkins	1.38	41.0%	0.22	6.7%	0.01	0.3%	1.74	52.0%	3.35	100.0%
Lakemore/Springfield	0.24	24.8%	0.02	1.9%	0.00	0.2%	0.70	73.1%	0.96	100.0%
Mogadore/Roosevelt	0.36	29.1%	0.03	2.5%	0.10	8.1%	0.74	60.4%	1.23	100.0%
Mud Run	0.83	30.2%	0.15	5.6%	0.07	2.4%	1.70	61.8%	2.74	100.0%
Mud Brook	0.98	40.6%	0.18	7.6%	0.09	3.8%	1.16	47.9%	2.42	100.0%
Tallmadge/Camp Brook	0.34	18.2%	0.10	5.3%	0.37	19.9%	1.06	56.6%	1.88	100.0%
Willow Run	3.69	44.8%	0.51	6.2%	2.46	29.9%	1.57	19.1%	8.23	100.0%
Wolf Ledges	1.02	12.6%	0.25	3.1%	1.37	17.0%	5.46	67.4%	8.11	100.0%
Copley	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
Coventry	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%
TOTAL	18.46	32.6%	3.27	5.8%	8.43	14.9%	26.45	46.7%	56.61	100.0%

District	2006 - Flow (mgd)									
	Res.	%	Com.	%	Ind.	%	I&I	%	TOTAL	%
Cuyahoga/Little Cuyahoga	7.39	37.6%	1.29	6.6%	3.58	18.2%	7.40	37.6%	19.67	100.0%
Cuyahoga Falls/NSI	1.73	29.4%	0.34	5.9%	0.34	5.9%	3.46	58.9%	5.88	100.0%
Fairlawn/Montrose	0.51	23.2%	0.17	7.7%	0.01	0.3%	1.51	68.8%	2.19	100.0%
Hawkins	1.37	41.0%	0.22	6.7%	0.01	0.3%	1.73	52.0%	3.33	100.0%
Lakemore/Springfield	0.25	24.8%	0.02	1.9%	0.00	0.2%	0.75	73.1%	1.03	100.0%
Mogadore/Roosevelt	0.36	29.1%	0.03	2.5%	0.10	8.1%	0.75	60.4%	1.25	100.0%
Mud Run	0.82	30.2%	0.15	5.6%	0.07	2.4%	1.68	61.8%	2.72	100.0%
Mud Brook	1.04	40.6%	0.20	7.6%	0.10	3.8%	1.22	47.9%	2.55	100.0%
Tallmadge/Camp Brook	0.35	18.2%	0.10	5.3%	0.38	19.9%	1.07	56.6%	1.90	100.0%
Willow Run	3.66	44.8%	0.50	6.2%	2.45	29.9%	1.56	19.1%	8.18	100.0%
Wolf Ledges	1.01	12.6%	0.25	3.1%	1.37	17.0%	5.43	67.4%	8.05	100.0%
Copley	0.25	69.0%	0.10	26.7%	0.02	4.3%	0.00	0.0%	0.36	100.0%
Coventry	0.03	25.0%	0.09	75.0%	0.00	0.0%	0.00	0.0%	0.12	100.0%
TOTAL	18.77	32.8%	3.46	6.1%	8.42	14.7%	26.58	46.4%	57.23	100.0%

District	2016 - Flow (mgd)									
	Res.	%	Com.	%	Ind.	%	I&I	%	TOTAL	%
Cuyahoga/Little Cuyahoga	7.34	37.6%	1.29	6.6%	3.56	18.2%	7.35	37.6%	19.54	100.0%
Cuyahoga Falls/NSI	1.77	29.4%	0.35	5.9%	0.35	5.9%	3.56	58.9%	6.03	100.0%
Fairlawn/Montrose	0.52	23.2%	0.17	7.7%	0.01	0.3%	1.55	68.8%	2.25	100.0%
Hawkins	1.36	41.0%	0.22	6.7%	0.01	0.3%	1.72	52.0%	3.31	100.0%
Lakemore/Springfield	0.28	24.8%	0.02	1.9%	0.00	0.2%	0.83	73.1%	1.14	100.0%
Mogadore/Roosevelt	0.37	29.1%	0.03	2.5%	0.10	8.1%	0.76	60.4%	1.26	100.0%
Mud Run	0.82	30.2%	0.15	5.6%	0.07	2.4%	1.67	61.8%	2.70	100.0%
Mud Brook	1.09	40.6%	0.21	7.6%	0.10	3.8%	1.29	47.9%	2.69	100.0%
Tallmadge/Camp Brook	0.35	18.2%	0.10	5.3%	0.38	19.9%	1.08	56.6%	1.91	100.0%
Willow Run	3.64	44.8%	0.50	6.2%	2.43	29.9%	1.55	19.1%	8.12	100.0%
Wolf Ledges	1.00	12.6%	0.25	3.1%	1.36	17.0%	5.39	67.4%	7.99	100.0%
Copley	0.26	64.5%	0.11	27.2%	0.03	8.3%	0.00	0.0%	0.40	100.0%
Coventry	0.08	45.2%	0.10	54.8%	0.00	0.0%	0.00	0.0%	0.19	100.0%
TOTAL	18.88	32.8%	3.50	6.1%	8.40	14.6%	26.75	46.5%	57.53	100.0%

TABLE 2-3

City of Akron Combined Sewer Overflows

City No.	Location	Area Acres	Receiving Water	NPDES Permit No.	Underground Utility Record No.
2	South Arlington Street District @ 9Th Avenue	337	Little Cuyahoga River	3PF00000081	732
3	Kelly Avenue @ expressway exit ramp	539	Little Cuyahoga River	3PF00000046	831
4	Mill Street @ Dart Avenue	99	Ohio Canal	3PF00000047	1175
5	River Street, northwest of Case Avenue	32	Little Cuyahoga River	3PF00000048	980
6	Factory Street @ River Street	112	Little Cuyahoga River	3PF00000049	881
7	Case Avenue, southwest of River Street	95	Little Cuyahoga River	3PF00000050	980
8	Case Avenue and Dublin Street	46	Little Cuyahoga River	3PF00000051	1031
9	Williams Street @ Kent Street	20	Little Cuyahoga River	3PF00000052	1031
10	Eastland Avenue, northeast of Newton Street	215	Little Cuyahoga River	3PF00000053	1031
11	Hazel Street, west of Wellington	412	Little Cuyahoga River	3PF00000054	1131
12	Home Ave. District, south of Evans at railroad	969	Camp Brook	3PF00000055	1331
13	Madeira St., south of North St. @ Dan St.	72	Little Cuyahoga River	3PF00000056	1279
14	North Forge St., west of Arlington Street	240	Little Cuyahoga River	3PF00000057	1229
15	Northeast of Elizabeth Park	232	Little Cuyahoga River	3PF00000058	1327
16[(1)]	Wolf Ledges Trunk, Exchange @ Ohio Canal	64	Ohio Canal	3PF00000059	1074
17[(1)(2)]	Exchange St. @ Canal/Opportunity Parkway	176	Ohio Canal	3PF00000060	1074
18	Innerbelt @ West Market Street	1,623	Ohio Canal	3PF00000061	1225
19	West Market Street @ Rand Avenue	144	Ohio Canal	3PF00000062	1225
20	West North Street @ Ohio Canal	45	Ohio Canal	3PF00000063	1325
21	North Howard Street @ Little Cuyahoga River	104	Little Cuyahoga River	3PF00000064	1325
22	Howard St, north of Lods Street	436	Little Cuyahoga River	3PF00000065	1325

TABLE 2-3 (Continued)

City of Akron Combined Sewer Overflows

City No.	Location	Area Acres	Receiving Water	NPDES Permit No.	Underground Utility Record No.
23	North Maple St., northeast of Hickory St.	50	Little Cuyahoga River	3PF00000066	1375
24	Hickory Street @ Ravine Street	369	Little Cuyahoga River	3PF00000067	1374
25	Otto Street @ Little Cuyahoga River	83	Little Cuyahoga River	3PF00000068	1375
26	Hickory Street, south of Memorial Parkway	160	Little Cuyahoga River	3PF00000069	1473
27	Uhler Avenue @ Memorial Parkway	97	Little Cuyahoga River	3PF00000070	1523
28	Memorial Parkway @ Hickory Street	304	Little Cuyahoga River	3PF00000071	1523
29	Cuyahoga Street @ Schultz Street	138	Little Cuyahoga River	3PF00000072	1574
30	Cuyahoga Street, north of Peck Road	69	Little Cuyahoga River	3PF00000073	1674
31	Little Cuyahoga River opposite of Cuyahoga St.	309	Little Cuyahoga River	3PF00000074	1723
32	Peck Road, northeast of Cuyahoga Street	280	Cuyahoga River	3PF00000075	1775
33	Peck Road, extended @ State Road	48	Cuyahoga River	3PF00000076	1876
34	Ohio Edison easement, west of Front Street	83	Cuyahoga River	3PF00000077	1828
35	Front Street @ Cuyahoga River	691	Cuyahoga River	3PF00000078	1779
36	N. of Poulson Dr. @ Rockwood Dr., east of RR	189	Cuyahoga River	3PF00000079	1822
37	Bowery Street inside Cascade parking deck	38	Ohio Canal	3PF00000080	1175
38[3]	High St.-Broadway , north of Bartges Street	1,446	-	-	974
39	Quaker Avenue @ Dart Avenue	46	Ohio Canal	3PF00000082	1174
40	Main Outfall Sewer @ Little Cuyahoga	--	Little Cuyahoga River	-	1723
	TOTAL	**10,412**			

(1) Alternate location: Ohio Canal at Buchtel Street

(2) Outlet for Rack 17 and Diversion Chamber

(3) Flow is routed through combined sewer overflow No. 16 and No. 17 (Rack 17/Diversion Chamber outlet)

selected to distinguish the effects of the CSO discharges on the receiving streams and took account the relative locations of the confluences with other streams. The Massillon Road CSO Monitoring Station is located upstream of all City of Akron CSOs on the Little Cuyahoga River. The purpose of this station is to assess upstream, background conditions. The Cedar Street CSO Monitoring Station is located to monitor the Ohio Canal upstream of major CSOs. The Lock 15 Station is located to monitor the Ohio Canal near its confluence with the Little Cuyahoga River. The Otto Street Station is located downstream of the confluence of the Ohio Canal and Little Cuyahoga River, and upstream of the confluence of the Little Cuyahoga and Cuyahoga Rivers. The Akron-Peninsula Road CSO Monitoring Station is located downstream of all known Cuyahoga River and Little Cuyahoga River CSO locations and tributary streams of CSO discharges. It is located on the Cuyahoga River upstream of Mud Brook.

The City of Akron has made a concerted effort to improve the collection system since the 1980 Facilities Plan. The most important improvement, in terms of improving water quality in the receiving streams, was the elimination of all sanitary sewer overflows (SSOs) within the Akron system. The City spent in excess of $25,000,000 on 24 projects to eliminate the SSOs.

Another important City program for improving water quality is the elimination of a number of septic system areas within the City limits. The cost of the proposed improvements is approximately $9,500,000. A total of approximately $3,000,000 has been spent thus far to complete several of the planned septic system elimination projects.

Additionally, to improve the available information concerning the collection system, the City installed permanent flow monitors in several trunk sewers to record flow data and depth sensors at each outfall to monitor system overflows.

2.4 Summary of Past CSO Control Work

The following is a summary of past CSO control work that has been performed by the City of Akron:

- **1980 Akron Facilities Plan**

  This was the facilities plan for the service area of the Akron WPCS. The work

included an Infiltration/Inflow study and an Sewer System Evaluation Study. CSOs were identified in the project. This report recommended a number of storage basins for CSO flow control, and was the first work in characterizing the CSO system. The City of Akron spent $2,340,750 on this project during a period from 1975 to 1983.

- **Retention Tank No. 2**

  A 3.9 million gallon retention facility was constructed near 9TH Avenue and Settlement Street in order to equalize flow to the Little Cuyahoga Interceptor and reduce overflows to the Little Cuyahoga River. Racks 2N and 2S are tributary to this retention basin. Flows up to the 6-month frequency design storm are retained by this facility. This project served as a model for the sizing and design of the storage and treatment facilities that were evaluated for the Long-Term Control Plan '98. The City of Akron spent $4,938,623 on this project during a period from 1980 to 1984.

- **Construction of Three In-stream Sampling Stations**

  The purpose of this project was to construct automatic in-stream sampling stations to bracket several CSOs on the Ohio Canal and help quantify pollutant loads from upstream Little Cuyahoga River Locations. The stations are located on the Ohio Canal, one at Cedar Street and one at Lock 15, and on the Little Cuyahoga River at Otto Street. The stations include sampling and monitoring equipment to assess river water quality parameters for NPDES reporting/monitoring. These sampling stations will be used in the Post-Construction Compliance Monitoring Program. They will also be used in future storm water monitoring activities. The City of Akron spent $345,529 on this project during a period from 1988 to 1990.

- **Rain Gauges**

  The City has installed a network of rain gauges throughout the service area of the WPCS. The data from these rain gauges are downloaded via computer at the Bureau of Engineer's offices. The information gathered is used for the CSO studies, NPDES

reporting/monitoring (associated with separate sanitary sewer overflows, CSOs and WPCS operations) and other wet weather related projects and activities. The rain gauges provided detailed data that was used to evaluate the operation of the CSO system. The rain gauge network will also be used in the Post-Construction Monitoring Program and will be used in future storm water monitoring activities. The City of Akron spent $69,000 on this project in 1992 and an additional $237,669 during a period from 1997 to 1999.

- **Ohio Canal Combined Sewer Overflow Study Phase I**

  This study analyzed the CSS tributary to the Ohio Canal Interceptor and provided a preliminary assessment of the water quality of the Ohio Canal. This report provided a summary of possible system improvements to mitigate the water quality impacts of CSO; evaluated the ramifications of the construction of such improvements on proposed development along the Ohio Canal; and developed a Phase II Plan of Study for additional analysis. This was the first study that targeted a specific area in the CSO system for detailed analysis. The City of Akron spent $146,183 on this project during a period from 1991 to 1992.

- **Ohio Canal Combined Sewer Overflow Study Phase II**

  This study continued the Phase I work and included an extensive amount of flow monitoring, water quality sampling and sewer system modeling to get a better understanding of the hydraulics of the racks and system tributary to the Ohio Canal Interceptor. It provided recommendations for short-term rack improvement and additional modeling to size conveyance facilities. This study began the characterization of the CSO system tributary to the Ohio Canal Interceptor and the Ohio Canal in downtown Akron. In this study, long-term and short-term flow monitors were installed to monitor the Ohio Canal, the Ohio Canal Interceptor, and 4 CSOs. Dry and wet weather sampling was conducted on both the CSOs and the Ohio Canal. A detailed model of both the collection system and the Ohio Canal was

developed, and used in subsequent studies. The City of Akron spent $684,165 on this project during a period from 1992 to 1994.

- **Cuyahoga and Little Cuyahoga Rivers CSO Study**

  This was the initial study that characterized the CSOs tributary to the Cuyahoga River, Little Cuyahoga River, and Camp Brook, and the CSS tributary to the Little Cuyahoga Interceptor and Main Outfall. The study identified the capacities of the existing sewers and combined sewer interceptor system. It also analyzed the existing water quality impacts of pollutants from CSOs. Dry and wet weather sampling was conducted on both the CSOs and the receiving waters (Cuyahoga and Little Cuyahoga Rivers). A detailed model of the collection system and the Cuyahoga River and Little Cuyahoga River was developed, and used in subsequent studies. The City of Akron spent $1,047,097 on this project during a period from 1991 to 1994.

- **Akron CSO System Wide Study Phase I and II**

  This was a comprehensive study that evaluated the operation of the combined and separate sewer systems; developed a site specific understanding of the biological and chemical impacts of CSOs; and documented the physical nature of the receiving streams to determine their use-attainability. Additional flow monitoring and sampling of the streams, overflows and sewers was performed under dry and wet weather conditions. The sewer system model was extended to include the separate sanitary interceptors and a receiving water model was developed. Biological sampling of the receiving waters in the planning areas was also conducted. The City of Akron spent $2,948,396 on Phase I of this project and $357,153 on Phase II of this project during a period from 1994 to 1999.

- **Combined Sewer Overflow Rack Improvements**

  The purpose of this project was to study, identify, and design improvements to the

CSO manholes and racks to prevent dry weather overflows, improve the City's ability to identify necessary maintenance, and improve the control of coarse solids and floatables by relatively simple means. The City of Akron spent $433,731 on this project during a period from 1994 to 1999.

- **Combined Sewer Overflow Monitoring System**

  The purpose of this project was to replace the existing "Autocon" CSO monitoring system with a new Motorola "Moscad" monitoring system. The Motorola system communicates all system messages back to the sewer maintenance facility and allows for early warning of potential CSO events. The data on number and length of overflows from this system are used in the NPDES reporting/monitoring, and were used in the calibration of the sewer system hydraulic model. (Note: Racks 2S, 2N, and 39 do not have monitors) The City of Akron spent $2,177,906 on this project during a period from 1993 to 1997.

- **Rehabilitation of Existing In-Stream/Combined Sewer Overflow Sampling Stations**

  The purpose of this project was to rehabilitate the existing CSO in-stream sampling stations that are located on the Little Cuyahoga River and the Ohio Canal. These automatic stations bracket CSOs on the Ohio Canal and help quantify pollution loads from upstream Little Cuyahoga River locations. The stations were improved by replacing the sampling system and the continuous monitoring probes. Further, a new communications system was installed to assure reliable communications between the Akron WPCS and these sampling stations. As previously indicated, these sampling stations are used for NPDES reporting/monitoring and will be used in the Post-Construction Compliance Monitoring Program. They will also be used in future storm water monitoring activities. The City of Akron spent $316,661 on this project during a period from 1994 to 1996.

- **Construction of Two New In-Stream Sampling Stations**

  The purpose of this project was to construct new in-stream sampling stations on the Little Cuyahoga River at Massillon Road and on the Cuyahoga River near the existing USGS Old Portage gauging station in the Merriman Valley. The stations include new sampling and monitoring equipment to assess river water quality parameters. Further, a communication system was installed to assure reliable communication between the Akron WPCS and the new sampling stations. These sampling stations are used for NPDES reporting/monitoring and will be used in the Post-Construction Compliance Monitoring Program. They will also be used in future storm water monitoring activities. The City of Akron spent $333,819 on this project during a period from 1995 to 1999.

- **Main Outfall Sewer Study**

  The purpose of this project was to complete a structural assessment of the primary sewer entering the Akron WPCS. Items investigated included: the internal and external conditions of the sewer, sources of inflow and infiltration, flow restrictions, and the structural conditions of all appurtenances associated with this sewer. The study made recommendations for a two phased rehabilitation program. This condition assessment determined that the Main Outfall was in good condition, and did not need to be replaced. This information eliminated the need to include replacing all or parts of the Main Outfall as part of alternative in the alternative evaluation of the Long-Term Control Plan '98. The City of Akron spent $1,608,683 on this project during a period from 1995 to 1999.

- **Facilities Plan Update**

  The purpose of this project was to update information presented in the 1980 facility plan, including descriptions of the planning area, demographics and land use, environmental conditions, environmentally sensitive areas, water quality, existing wastewater collection systems, existing wastewater treatment systems, and future

situations. The City of Akron spent $403,343 on this project during a period from 1996 to 1998.

- **Facilities Plan '98**

  The purpose of this project was to complete the characterization of the Akron wastewater collection system and receiving waters through sampling and modeling; evaluate alternatives for improving the combined sewer system and water pollution control station; and present the most cost-effective means of meeting established effluent goals, water quality goals, and recognized environmental and social considerations. The City of Akron spent $3,371,513 on this project during a period from 1997 to present.

The information obtained in performing this work and the results were used in developing and completing the Long-Term Control Plan '98. The studies described above can be provided upon request.

2.5 Flow Monitoring and Sampling

The initial flow monitoring and sampling of the CSS was performed during the study for the 1980 Akron Facilities Plan. Further flow monitoring and sampling of the CSS was performed in the Ohio Canal Phase I & II, the Cuyahoga & Little Cuyahoga Phase I & II and the CSO System Wide studies. As part of the CSO System Wide Study, a use attainability analysis was performed to determine the attainability of the designated water quality standards in the receiving streams. In general, it was found that the receiving streams have a water chemistry that should support a warm water habitat biological community (modified warm water habitat for the Ohio Canal). There were no observed toxic or metal impairments. However, with regard to biological criteria, the streams were generally found to be in partial attainment or non-attainment of their aquatic life use designations. Therefore, additional CSO sampling and subsequent modeling has and will generally target biological criteria (dissolved oxygen, oxygen demand, fecal coliform) rather than water chemistry parameters such as heavy metals.

The 1997 Sampling, Flow Monitoring and Analysis Program was the final data collection effort prior to the development of the Long-Term Control Plan '98. The data collected during this task was used in the development and calibration of the collection system and receiving streams hydraulic and water quality models.

The data collection for the Long-Term Control Plan '98 consisted of two separate tasks that were performed concurrently. The first task was the comprehensive Flow Monitoring Program, which consisted of a Long-Term Flow Monitoring Program utilizing 21 permanent flow monitors and a Short-Term Flow Monitoring Program utilizing 22 temporary flow monitors.

The second task was the Water Quality Sampling Program. The water quality sampling was conducted in two separate sampling programs: the Discrete Grab Sampling Program and the long-term, in-stream Dissolved Oxygen Monitoring Program.

A detailed summary of the flow monitoring and sampling program is presented in **Facilities Plan '98 - Alternatives** Chapter 11.

2.6 Hydraulic Model of Collection System and Receiving Waters

An essential tool developed as part of the project effort was a system modeling framework to examine the hydraulic and water quality response in the collection and receiving water systems during wet weather conditions.

Information on existing system conditions obtained from the modeling tools, combined with other information sources, such as water quality sampling data and biological measures, was used by the project team in several ways:

- to prioritize the City's CSO locations in terms of hydraulic measures (overflow volume, peak overflow rate, overflow frequency, and overflow duration);
- to develop an understanding of the stressors on the City's receiving water system; and
- to establish a baseline from which to assess the impact of system abatement alternatives, in terms of both CSO measures and water quality measures.

The City's modeling framework has been developed to support a receiving water analysis from a watershed perspective. In order to support a watershed analysis, the framework must contain components to account for relevant inputs to the collection and receiving water systems and relevant processes within these systems.

The dry weather flow, infiltration and inflow, and surface runoff components are represented in the XP-SWMM model. In addition, the collection system model and the hydrodynamics of the receiving water model are represented in the XP-SWMM model. For the water quality component of the receiving water model, the framework uses the USEPA WASP model. The hydrodynamic output from XP-SWMM TRANSPORT is linked directly to the WASP model to perform the water quality analysis.

The bulk of the collection system modeling tools used in the Long-Term Control Plan '98 analysis were obtained from previous studies conducted by the City (refer to Section 7.0 for the listing of the reference documents). The hydrodynamic portion of the receiving water model used in this analysis was obtained from earlier City studies, with several refinements incorporated. The water quality (fate and transport) component was developed specifically for this analysis using the USEPA WASP model. All receiving water reaches in the hydrodynamic model were checked to confirm the reasonableness of the channel configurations (refer to Section 2.8 for the discussion of the calibration of the model).

2.7 Water Quality Model of Receiving Waters

The water quality model predicts time-varying bacteria and dissolved oxygen (DO) in the City's receiving streams. The model accounts for input flows and loads from all watershed sources, as follows:

- upstream inflows to the Cuyahoga River, Little Cuyahoga River, and Ohio Canal;
- in-system stream inflows (e.g., Camp Brook);
- direct separate storm system discharges during wet weather; and
- CSOs during wet weather.

The model was developed using the USEPA WASP model. WASP is a dynamic model that predicts water quality conditions in receiving water systems subject to natural phenomena and man-made inputs. The model accounts for the time-varying processes of advection, dispersion, point and diffuse mass loadings, and boundary exchanges. The basic principle behind WASP is the conservation of mass. The water volume and water quality constituent masses are tracked and accounted for over time and space using a series of mass-balancing equations. The model traces each water quality constituent from its point of spatial and temporal input to its final point of export or decay, conserving mass in space and time.

As applied in this analysis, the WASP model accounts for bacteria and the DO cycle in the water column in response to time-varying advection, point loadings of bacteria, 5-day carbonaceous oxygen demand ($CBOD_5$), DO concentrations, and reaeration. The model accounts for the temperature-dependent biodegradation of bacteria and oxygen-demanding $CBOD_5$ introduced through the point loadings.

2.8 Calibration of the Hydraulic and Water Quality Models

The hydraulic model of the sewer system and receiving waters was verified against flow monitoring data that was collected from previous studies performed in 1994 and 1996, and the data collected as part of the current project. The results are presented in Appendix 12-A of the **Facilities Plan '98 - Appendices**. A detailed discussion of the calibration results is presented in Section 12.2 of the **Facilities Plan '98 - Alternatives**.

The water quality model was calibrated for fecal coliform bacteria and DO. The formal fecal coliform bacteria calibration process used data from the October 26, 1997 and December 10, 1997 events, and the formal DO calibration process used data from the October 26, 1997 event and the dry weather period from October 16 - October 23, 1997 (defined by the project flow monitoring program). The results are presented in Appendix 12-B of the **Facilities Plan '98 - Appendices**. A detailed discussion of the results is presented Section 12.2 of the **Facilities Plan '98 - Alternatives**.

2.9 Existing Conditions - Model Results

In anticipation of evaluating CSO impacts upon the receiving streams, data was obtained

from the CSO areas, as set forth in Section 2.5, Flow Monitoring and Sampling. In addition, data was also collected from stream segments upstream from each of the CSO areas. Notably, the data from the upstream segments demonstrated noncompliance with water quality standards. These upstream conditions must be considered when evaluating the impacts of CSOs on water quality in the receiving streams.

The hydraulic and water quality models were utilized to evaluate the existing conditions of the sewer system and receiving waters. A detailed discussion of the modeled results of the existing conditions is presented in Section 12.3 of the **Facilities Plan '98 - Alternatives.** The hydraulic collection system model was used to simulate the 1994 precipitation year in its entirety to characterize the system's existing condition baseline. The 1995 CSO System-Wide Study established 1994 as an average precipitation year, based on an analysis of 33 years of rainfall data for the Akron area (although the year had an atypical cluster of four very large events in its annual event distribution). The analysis established average precipitation values for annual volume, event average intensity, event duration, event volume, and inter-event duration. The 1994 precipitation year was used to model important annual hydraulic measures for the CSOs, including annual overflow volume, peak overflow rate, number of overflow events, number of overflow hours, and pounds of $CBOD_5$. The results are summarized in Tables 2-4 through 2-7.

The water quality model was used to predict time-varying bacteria and DO in the receiving streams, consisting of the Cuyahoga River, Little Cuyahoga River, and Ohio Canal. The impact of pollutant sources was evaluated using a single event simulation, based on a rainfall event that occurred October 26, 1997, and a continuous simulation of the six-month recreational period (May-October), based on the 1994 precipitation year. The single event simulation (0.91 inches of rainfall over a period of 22 hours, approximately equivalent to a 1-month design storm) indicates the following DO and bacteria impacts:

- The Ohio Canal does not experience a local DO drop under this simulation.

- The Little Cuyahoga River downstream of the Ohio Canal is affected directly by the Ohio Canal $CBOD_5$ load.

TABLE 2-4
Existing System
1994 Precipitation Year Rack Overflows -- Ranked by Annual Overflow Volume
(Based on Predictions from the Hydraulic Collection System Model)

	Annual						
Rack No.	Volume (MG)	Percent of Total Overflow	Cumulative Percent of Total Overflow	Peak Q (mgd)	# of Events[1]	# of Hours	CBOD [lbs]
40	452.6	36.5%	36.5%	113.8	40	282	283,267
18	213.9	17.2%	53.7%	272.7	26	151	133,908
Diversion Chamber/Rack 17	143.4	11.6%	65.3%	148.0	44	247	89,755
16	119.7	9.6%	74.9%	122.8	39	225	74,914
35	44.5	3.6%	78.5%	81.4	49	123	27,858
12	44.2	3.6%	82.1%	133.8	34	53	27,671
14	27.5	2.2%	84.3%	36.5	55	187	17,183
24	23.9	1.9%	86.2%	49.7	46	102	14,936
3	16.0	1.3%	87.5%	41.0	38	69	10,020
32	15.3	1.2%	88.8%	42.1	39	66	9,598
15	14.9	1.2%	90.0%	32.6	44	92	9,317
28	13.1	1.1%	91.0%	32.1	40	75	8,194
29	11.5	0.9%	91.9%	18.0	45	160	7,210
22	11.3	0.9%	92.9%	58.8	19	23	7,070
26	10.7	0.9%	93.7%	18.5	52	127	6,695
31	8.5	0.7%	94.4%	32.4	25	35	5,338
4	8.5	0.7%	95.1%	26.1	22	45	5,338
10	8.0	0.6%	95.7%	24.2	33	56	5,010
36	7.8	0.6%	96.4%	22.6	34	55	4,869
11	6.7	0.5%	96.9%	34.3	15	25	4,190
20	6.7	0.5%	97.4%	13.8	44	91	4,176
34	5.9	0.5%	97.9%	11.8	46	93	3,671
19	5.2	0.42%	98.3%	24.3	16	25	3,226
30	4.1	0.33%	98.7%	7.9	25	91	2,589
7	3.7	0.30%	99.0%	15.1	23	33	2,346
8	2.9	0.24%	99.2%	7.0	38	67	1,845
5	2.5	0.20%	99.4%	12.5	19	23	1,554
27	2.3	0.19%	99.6%	10.2	21	29	1,437
33	1.5	0.12%	99.7%	3.6	26	51	936
21	1.3	0.10%	99.8%	11.8	9	11	787
25	1.2	0.10%	99.9%	7.6	13	16	754
13	0.6	0.05%	100.0%	5.6	10	10	390
37	0.3	0.02%	100.0%	5.0	6	6	178
9	0.2	0.01%	100.0%	1.9	6	7	115
23	0.0	0.00%	100.0%	1.4	3	3	21
39	0.0	0.00%	100.0%	0.0	0	0	0
2-S & 2-N	0.0	0.00%	100.0%	0.0	0	0	0
6	0.0	0.00%	100.0%	0.0	0	0	0
Total	1,240.4				1,044	2,754	776,366
Akron WPCS Flow[2]	26,481.0			109.2	On Going	On Going	---
Akron WPCS Secondary Bypass	1,200.0			115.7	27	461	300,300

Total Annual Overflow Volume	1,240	MG	776,368
Total Akron WPCS Secondary Flow[2]	26,800	MG	---
Total Akron WPCS Secondary Bypass	1,200	MG	300,300 lbs CBOD
Total System Flow	29,240	MG	

Notes:

1) Number of Events based on 6-hour inter-event time

2) Akron WPCS flow represents secondary treatment, using maximum rate of 110 mgd, and assumes the stormwater retention pumping capacity is not exceeded. This volume includes the volume released back to the Akron WPCS after having up to 10 MG stored on an event basis.

TABLE 2-5
Existing System
1994 Precipitation Year Rack Overflows -- Ranked by Annual Peak Overflow Rate
(Based on Predictions from the Hydraulic Collection System Model)

Rack No.	Annual			
	Peak Q (mgd)	Volume (MG)	# of Events[1]	# of Hours
18	272.7	213.9	26	151
Diversion Chamber/Rack 17	148.0	143.4	44	247
12	133.8	44.2	34	53
16	122.8	119.7	39	225
40	113.8	452.6	40	282
35	81.4	44.5	49	123
22	58.8	11.3	19	23
24	49.7	23.9	46	102
32	42.1	15.3	39	66
3	41.0	16.0	38	69
14	36.5	27.5	55	187
11	34.3	6.7	15	25
15	32.6	14.9	44	92
31	32.4	8.5	25	35
28	32.1	13.1	40	75
4	26.1	8.5	22	45
19	24.3	5.2	16	25
10	24.2	8.0	33	56
36	22.6	7.8	34	55
26	18.5	10.7	52	127
29	18.0	11.5	45	160
7	15.1	3.7	23	33
20	13.8	6.7	44	91
5	12.5	2.5	19	23
34	11.8	5.9	46	93
21	11.8	1.3	9	11
27	10.2	2.3	21	29
30	7.9	4.1	25	91
25	7.6	1.2	13	16
8	7.0	2.9	38	67
13	5.6	0.6	10	10
37	5.0	0.3	6	6
33	3.6	1.5	26	51
9	1.9	0.2	6	7
23	1.4	0.0	3	3
39	0.0	0.0	0	0
2-S & 2-N	0.0	0.0	0	0
6	0.0	0.0	0	0
Total		1,240.4	1,044	2,754
Akron WPCS Flow[2]	109.2	26,481.0	On Going	On Going
Akron WPCS Secondary Bypass	115.7	1,200.0	27	461

Total Annual Overflow Volume	1,240	MG
Total Akron WPCS Secondary Flow[2]	26,800	MG
Total Akron WPCS Secondary Bypass	1,200	MG
Total System Flow	29,240	MG

Notes:
1) Number of Events based on 6-hour inter-event time
2) Akron WPCS flow represents secondary treatment, using maximum rate of 110 mgd, and assumes the stormwater retention pumping capacity is not exceeded. This volume includes the volume released back to the Akron WPCS after having up to 10 MG stored on an event basis.

TABLE 2-6
Existing System
1994 Precipitation Year Rack Overflows -- Ranked by Annual Number of Event
(Based on Predictions from the Hydraulic Collection System Model)

Rack No.	Annual			
	# of Events[1]	Peak Q (mgd)	Volume (MG)	# of Hours
14	55	36.5	27.5	187
26	52	18.5	10.7	127
35	49	81.4	44.5	123
24	46	49.7	23.9	102
34	46	11.8	5.9	93
29	45	18.0	11.5	160
Diversion Chamber/Rack 17	44	148.0	143.4	247
15	44	32.6	14.9	92
20	44	13.8	6.7	91
40	40	113.8	452.6	282
28	40	32.1	13.1	75
16	39	122.8	119.7	225
32	39	42.1	15.3	66
3	38	41.0	16.0	69
8	38	7.0	2.9	67
12	34	133.8	44.2	53
36	34	22.6	7.8	55
10	33	24.2	8.0	56
18	26	272.7	213.9	151
33	26	3.6	1.5	51
31	25	32.4	8.5	35
30	25	7.9	4.1	91
7	23	15.1	3.7	33
4	22	26.1	8.5	45
27	21	10.2	2.3	29
22	19	58.8	11.3	23
5	19	12.5	2.5	23
19	16	24.3	5.2	25
11	15	34.3	6.7	25
25	13	7.6	1.2	16
13	10	5.6	0.6	10
21	9	11.8	1.3	11
37	6	5.0	0.3	6
9	6	1.9	0.2	7
23	3	1.4	0.0	3
39	0	0.0	0.0	0
2-S & 2-N	0	0.0	0.0	0
6	0	0.0	0.0	0
Total	1,044		1,240.4	2,754
Akron WPCS Flow[2]	On Going	109.2	26,481.0	On Going
Akron WPCS Secondary Bypass	27	115.7	1,200.0	461

Total Annual Overflow Volume	1,240	MG
Total Akron WPCS Secondary Flow[2]	26,800	MG
Total Akron WPCS Secondary Bypass	1,200	MG
Total System Flow	29,240	MG

Notes:
1) Number of Events based on 6-hour inter-event time
2) Akron WPCS flow represents secondary treatment, using maximum rate of 110 mgd, and assumes the stormwater retention pumping capacity is not exceeded. This volume includes the volume released back to the Akron WPCS after having up to 10 MG stored on an event basis.

TABLE 2-7
Existing System
1994 Precipitation Year Rack Overflows -- Ranked by Annual Number of Hours
(Based on Predictions from the Hydraulic Collection System Model)

Rack No.	Annual			
	# of Hours	Peak Q (mgd)	Volume (MG)	# of Events
40	282	113.8	452.6	40
Diversion Chamber/Rack 17	247	148.0	143.4	44
16	225	122.8	119.7	39
14	187	36.5	27.5	55
29	160	18.0	11.5	45
18	151	272.7	213.9	26
26	127	18.5	10.7	52
35	123	81.4	44.5	49
24	102	49.7	23.9	46
34	93	11.8	5.9	46
15	92	32.6	14.9	44
20	91	13.8	6.7	44
30	91	7.9	4.1	25
28	75	32.1	13.1	40
3	69	41.0	16.0	38
8	67	7.0	2.9	38
32	66	42.1	15.3	39
10	56	24.2	8.0	33
36	55	22.6	7.8	34
12	53	133.8	44.2	34
33	51	3.6	1.5	26
4	45	26.1	8.5	22
31	35	32.4	8.5	25
7	33	15.1	3.7	23
27	29	10.2	2.3	21
11	25	34.3	6.7	15
19	25	24.3	5.2	16
22	23	58.8	11.3	19
5	23	12.5	2.5	19
25	16	7.6	1.2	13
21	11	11.8	1.3	9
13	10	5.6	0.6	10
9	7	1.9	0.2	6
37	6	5.0	0.3	6
23	3	1.4	0.0	3
39	0	0.0	0.0	0
2-S & 2-N	0	0.0	0.0	0
6	0	0.0	0.0	0
Total	2,754		1,240.4	1,044
Akron WPCS Flow[2]	On Going	109.2	26,481.0	On Going
Akron WPCS Secondary Bypass	461	115.7	1,200.0	27

Total Annual Overflow Volume	1,240	MG
Total Akron WPCS Secondary Flow[2]	26,800	MG
Total Akron WPCS Secondary Bypass	1,200	MG
Total System Flow	29,240	MG

Notes:

1) Number of Events based on 6-hour inter-event time

2) Akron WPCS flow represents secondary treatment, using maximum rate of 110 mgd, and assumes the stormwater retention pumping capacity is not exceeded. This volume includes the volume released back to the Akron WPCS after having up to 10 MG stored on an event basis.

- The Cuyahoga River has a long continuous reach of relatively depressed DO from the confluence with the Little Cuyahoga River downstream to the Akron WPCS. The downstream portion of the Ohio Canal has fecal coliform levels elevated above ambient conditions for the longest periods of time in the system (System-wide, fecal coliform levels remained elevated above ambient conditions for at least 17 hours and up to 96 hours in all model reaches).

- All modeled reaches of the Cuyahoga River in the CSO area upstream of the confluence with the Little Cuyahoga River show fecal coliform concentrations remain elevated above ambient conditions for a relatively long period. The occurrence of the long-duration elevated concentrations extends upstream of the Northside Interceptor CSO inflows, thus implicating boundary conditions and non-point sources.

The six-month recreational period was simulated to evaluate compliance with the applicable water quality standards. This evaluation indicates the following results:

- Model-predicted DO is never below the 5.0 milligrams per liter water quality standard in any of the receiving waters. Although, it is noted that the model does not account for diurnal variations due to photosynthesis and respiration, which could depress the average DO values into a limited number of periods of noncompliance.

- Modeling of the Cuyahoga River within and downstream of the CSO area predicts difficulties in achieving compliance with the bacteriological standard for five to six months of the six-month recreational period simulated.

- Modeling of the Little Cuyahoga River within the CSO area predicts difficulties in achieving compliance with the bacteriological standard for five months of the six-month recreational period simulated.

- Modeling of the Ohio Canal within the CSO area predicts difficulties in achieving compliance with the bacteriological standard for six months of the six-month recreational period simulated.

As set forth at the outset of this section, data from the stream segments entirely upstream of the CSO area (boundary conditions) demonstrates noncompliance with applicable water quality standards. In light of the upstream impacts, the modeling conducted to date is not conclusive with regard to reason for inability to meet applicable water quality standards in the receiving streams in the CSO area. Specifically, data collected upstream of the CSO area indicates as follows:

- Upstream boundary conditions on the Cuyahoga River near the Cuyahoga Falls Sheraton Suites demonstrate noncompliance with the bacteriological standard for every month in the six-month recreational period simulated.

- Upstream boundary conditions on the Little Cuyahoga River near Skelton Road demonstrate noncompliance with the bacteriological standard for three months out of the six-month recreational period.

- Upstream boundary conditions on the Ohio Canal near the Ohio Department of Natural Resources station demonstrate noncompliance with the bacteriological standards for five of the six-month recreational period simulated.

- Upstream boundary conditions are fully described in Facilities Plan '98 reference document 15, *Water Quality Modeling, Existing System Conditions, Technical Memorandum*, April 1998.

3.0 IDENTIFICATION OF SENSITIVE AREAS

3.1 Introduction

The CSO Control Policy requires municipalities to give the highest priority to controlling overflows to receiving waters considered sensitive. Wherever possible and economically feasible, the plan shall eliminate or relocate existing overflows to sensitive areas. According to the CSO Control Policy, sensitive areas include:

- Outstanding National Resource Waters;
- National Marine Sanctuaries;
- Waters with threatened or endangered species or their designated critical habitat;
- Primary contact recreation waters, such as bathing beaches;
- Public drinking water intakes or their designated protection areas; and
- Shellfish beds.

The sensitive areas within the City of Akron planning area are described briefly in this section and in greater detail in **Facilities Plan '98** Chapter 5.

3.2 State Resource Waters

The ten major subbasins within the planning area are: (1) Yellow Creek; (2) Mud Brook; (3) Furnace Run; (4) Cuyahoga River; (5) Little Cuyahoga River; (6) Ohio Canal; (7) Sand Run; (8) Woodward Creek; (9) Pigeon Creek; and (10) Mud Run. Mud Run and Pigeon Creek drain to the Tuscarawas River basin, while the remaining areas are direct tributaries to the Cuyahoga River.

The Cuyahoga River drains approximately 813.3 square miles, of which 27.0 square miles are located in the planning area. The elevation of the river ranges from 573 feet above mean sea level (MSL) at its mouth on Lake Erie to 1,290 feet above MSL near its sources. This represents an average gradient of 7.1 feet per mile. The portion of the Cuyahoga River within the planning area extends from river mile 37.2 (Yellow Creek) to river mile 52.0 (Munroe Falls Dam). However, flow monitoring and sampling extended farther downstream to river mile 33.3 (Bolanz Road).

The State of Ohio's Water Quality Standards assign three (3) designations, aquatic life

habitat, water supply use, and recreational use, to all bodies of water in the State of Ohio. The Cuyahoga River in the planning area is designated as a warm water habitat for aquatic life and primary contact for recreation use in the State of Ohio's Water Quality Standards. In addition, there are two sub-segments that have the added designation as State Resource Waters in the Water Quality Standards: the segment through the Gorge and Cascade Valley Metropolitan Parks, which are located at the boundary between the City of Akron and the City of Cuyahoga Falls, and the segment from Bath Road north which is in the Cuyahoga Valley National Recreation Area.

3.3 Gorge and Cascade Valley Metropolitan Parks

As previously mentioned, the Gorge and Cascade Valley Metropolitan Parks are located along the Cuyahoga River at the boundary between the City of Akron and the City of Cuyahoga Falls. These facilities provide a unique urban park setting, combining natural scenic vistas and hike trails with recreational activity areas (such as ball fields and sledding hills). The parks incorporate many unique features associated with the Cuyahoga River, its flood plain and the valley rim. Oak Blackgum, Tuliptrees, and Yellow Birch are common in the woods that cover the gorge valley walls. Water rushes through the valley in areas of rapids. A variety of fish live in the river, providing prey for Belted Kingfisher, Great Blue Heron, and Green-backed Heron. In the spring, the Ohio state flower, White Trillium, grows in the floodplain woods, and a variety of wildflowers are abundant in the summer and fall. The parks are located within the facilities planning area, adjacent to the area of the Northside Interceptor CSOs.

3.4 Cuyahoga Valley National Recreation Area

This nature preserve stretches 22 miles along the Cuyahoga River between Akron and Cleveland and encompasses approximately 33,000 acres of relatively undeveloped, scenic, open space. Established as a national recreation area in 1974, the area is administered by the U.S. Department of the Interior, National Park Service. It includes a number of Akron and Cleveland metropolitan parks, and their associated facilities including hiking and biking trails, camping and fishing areas, field sports centers, and a variety of scenic and cultural attractions. Its expansive area protects environmentally sensitive features such as mature woodlands, rolling meadows, gentle

farmlands, ravines, gorges, ledges, river bends and meandering streams. The park provides habitat for many rare species of plants and threatened, potentially threatened, and endangered species of wildlife. The park also contains several historic and archaeologically significant sites. All of the lands in this recreation area are being preserved by the federal government and are not available for development. The park is located downstream of the City of Akron WPCS discharge and the entire CSS.

3.5 Ohio & Erie Canal National Heritage Corridor

The Ohio & Erie Canal National Heritage Corridor is a federal historical corridor that stretches from Cleveland through Akron and Canton to New Philadelphia. The boundaries of this corridor generally follow the Ohio & Erie Canal, which parallels the Cuyahoga River in northern Summit County and the Tuscarawas River in southern Summit County. The Ohio & Erie Canal passes through the center of the City of Akron before connecting to the Tuscarawas River basin. The final management plan for this corridor will control federal funding that will be used to build new trails, rail links, and visitor centers. The plan for the corridor must still receive federal approval.

3.6 Cuyahoga American Heritage River

The American Heritage Rivers initiative program was implemented by the federal government to help communities restore and protect hometown rivers. The Cuyahoga River was one of 14 rivers designated nationally on July 30, 1998 as part of the American Heritage Rivers initiative. The "Partners" that formed the American Heritage Task Force for the Cuyahoga River Watershed in northeast Ohio and submitted the nomination for the initiative includes representatives from:

- The Cuyahoga River Remedial Action Plan
- Ohio & Erie Canal Association
- Upper Cuyahoga River Watershed Task Force
- Northeast Ohio Areawide Coordinating Agency
- Northeast Ohio Four County Regional Planning and Development Organization

The American Heritage Rivers initiative helps community-based efforts to revitalize rivers, neighborhoods, and waterfronts. The initiative integrates state, local, federal, and private expertise and resources to achieve community-identified goals including natural resources management, economic development, environmental protection, and historic preservation.

The Forest Service, State and Private Forestry Northeastern Area, was selected by the Partners and the U.S. Department of Agriculture to serve as the sponsoring federal agency to coordinate federal resources and provide a River Navigator (coordinator) to act as a liaison between the Partners and federal agencies. The River Navigator will provide assistance to communities in implementing a plan of action developed by the Partners.

4.0 ALTERNATIVE IDENTIFICATION AND EVALUATION

4.1 Introduction

A range of CSO improvement alternatives was evaluated in the preparation of the long-term control plan. These alternatives included storage and treatment alternatives, collection system controls, source controls, non-traditional alternatives, and improvements at the City of Akron Water Pollution Control Station (WPCS). The objective of each technology considered was to reduce or eliminate CSO and to provide an improvement in the water quality of the Ohio Canal, Little Cuyahoga and Cuyahoga Rivers, and Camp Brook. The advantages and disadvantages of each alternative were considered as part of the screening process.

According to the CSO Control Policy there are two approaches that can be used in addressing CSOs, the "presumption" and "demonstration" approaches. In the "presumption" approach, *a program that meets any of the three criteria listed below would be presumed to provide an adequate level of control to meet the water quality-based requirements of the Clean Water Act, provided that the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the characterization, monitoring, and modeling of the system and the consideration of sensitive areas. These criteria are provided because data and modeling of wet weather events often do not give a clear picture of the level of controls necessary to protect the water quality standards.*

- *no more than an average of four overflow events per year, provided that the NPDES permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a combined sewer system as the result of a precipitation event that does not receive the minimum treatment specified below; or*
- *The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the combined sewer system during precipitation events on a system-wide annual average basis; or*
- *The elimination or removal of no less than the mass of the pollutants, identified as causing water quality impairment through the sewer system characterization,*

monitoring, and modeling effort, for the volumes that would be eliminated or captured for treatment under the previous paragraph.

The minimum treatment specified in the first paragraph consists of the following:

- Primary clarification, which includes removal of floatables and settleable solids;
- Solids and floatables disposal; and
- Disinfection of the effluent.

In the "demonstration" approach, the City of Akron would have to *demonstrate that a selected control program, is adequate to meet the water quality-based requirements of the Clean Water Act. The permittee must demonstrate each of the following:*

- *the planned control program is adequate to meet the Water Quality Standards and protected designated uses, unless the water quality standards or uses can not be met as a result of natural background conditions or pollution sources other than CSOs;*
- *the CSO discharges remaining after implementation of the planned control program will not preclude the attainment of water quality standards or the receiving waters' designated uses or contribute to their impairment. Where water quality standards and designated uses are not met in part because of natural background conditions or pollution sources other than CSOs, a total maximum daily load, including a wasteload allocation and a load allocation , or other means should be used to apportion pollutant loads;*
- *the planned control program will provide the maximum pollution reduction benefits reasonably attainable; and*
- *the planned control program is designed to allow cost-effective expansion or cost-effective retrofitting if additional controls are subsequently determined to be necessary to meet the water quality standards or designated uses.*

The approach taken with Long-Term Control Plan '98 is the "presumption" approach. This approach was taken because screening-level investigations with the water quality model revealed that attaining recreational water quality standards was not possible even with complete sewer separation, which had a cost that exceeded $1 billion. Wet weather sources continued to have bacteria levels that were high enough to cause noncompliance with the water quality standards.

The method for meeting the "presumption" approach was to propose CSO control projects at each outfall based on cost versus performance curves, where for lower levels of CSO control, small increments of increased cost resulted in large increments of improved performance, and for high levels of CSO control, large increments of increased cost resulted in small increments of improved performance. The optimal point, or "knee of the curve", was selected where the incremental change in cost per change in performance changes most rapidly. This approach when applied to basin and tunnel sizing, as described in **Facilities Plan '98 - Alternatives** - Section 13.2.1 Satellite Storage and Treatment Facilities, resulted in the same approximate levels of control whether rack overflows were controlled by treatment basins, storage basins, or tunnels. Therefore, different combinations of these control technologies used in different alternative integrated plans would result in the same approximate levels of control.

Based upon the provisions of the U.S. EPA April 19, 1994, CSO Control Policy and the March, 1995, Ohio EPA CSO Strategy, the following terms were interpreted to have the corresponding meanings:

- *Combined Sewer System* means the entire collection system.
- *Combined Sewage* means the total flow that enters the collection system during a precipitation event. This included all storm water, sanitary sewage, and infiltration.
- *Captured* means all CSO captured in storage basins (collection system and at the WPCS), treatment basins, and tunnels.
- *Treatment* means primary clarification, solids and floatables disposal, and disinfection (treatment basins and WPCS only) up to the individual projects designated design storm. This applies to storage basins (collection system and at the WPCS), treatment basins, and tunnels.

- *Precipitation Event* was defined as occurring when flows at the WPCS exceeded the average daily flow of 76.5 mgd.

4.2 Collection System Alternatives

As per Section 2.5, the focus of the collection system alternatives was on the reduction of bacteria levels, solids, volume, $CBOD_5$, and floatables in the discharge from the combined sewer system. A preliminary screening of alternatives was performed on a wide range of solutions for these problems. This preliminary screening developed a list of feasible alternatives that were considered to be applicable to the Akron combined sewer system. These feasible alternatives were evaluated in detail. These alternatives included storage and treatment alternatives, collection system controls, floatable controls, and non-traditional alternatives. The effectiveness of each technology evaluated was determined as part of the overall evaluation of the improvement. The effectiveness of the alternatives was determined through water quality modeling and by evaluating CSO impacts.

Storage and treatment alternatives included:

- deep tunnels, designed to capture CSO from several racks in areas where large volumes of overflow cause odors, floatables, and water quality problems, and/or in areas where failing infrastructure is a concern;
- storage basins, are designed to provide storage, screening, and settling of overflows at racks up to the capacity of a selected design storm, and to dewater the basins to the interceptors within a relatively short time frame; and
- treatment basins, which are smaller than storage basins, are also designed for storage, screening, and other settling up to the capacity of a selected design storm, and to dewater the basins to the interceptors within a relatively short time frame. In addition, the discharge to the receiving waters is disinfected.

Floatable control alternatives included:

- in-line vortex separator technology, designed to separate and trap floatables and debris in a screened basket for removal after storm events; and
- in-line or end-of-pipe netting systems, designed to trap floatables in mesh bags which can be disposed of and replaced after storm events.

Collection system controls included:

- complete or partial separation of sewers in combined sewer areas, which would involve the installation of storm sewers in most cases;
- express sewers, which were evaluated in areas where a separate sanitary line could be identified upstream of Racks 11,12, and 18 known to be a large contributor of CSO to the system; and
- regulator modifications, which involved altering the rack configuration (e.g., raising overflow weir height) or moving the location of the rack.

Non-traditional alternatives included:

- designating undeveloped "set-back" areas along the Cuyahoga and Little Cuyahoga Rivers and the Ohio Canal, to preserve natural areas and prevent any further development along the waterways;
- stream restoration or channel repair to improve habitat for biological communities; and
- re-aeration structures to improve aeration in stream channels.

4.3 WPCS Alternatives

The WPCS was first analyzed to determine the maximum flow rates for complete treatment (primary and secondary, etc.) and for primary treatment and disinfection. The CSO Control Policy requires that treatment at the WPCS be maximized, meaning that the collection system is delivering the maximum flow to the WPCS and this maximum flow is being treated completely or partially

before being discharged to the receiving waters. This analysis determined the course that would be followed in developing WPCS alternatives for evaluation. The analysis of the WPCS is presented in Section 14 of the document **Facilities Plan '98 - Alternatives.** The analysis showed that the WPCS is capable of providing complete treatment for a maximum WPCS influent flow rate of 110 mgd, and partial treatment, primary and screening, from 110 mgd to 280 mgd (the capacity of the Main Outfall).

WPCS alternatives included:

- additional retention, which would reduce secondary bypasses, involves constructing additional tanks to capture and hold peak flows during wet weather events for treatment when the WPCS is capable of providing full treatment;
- septage receiving station, for receiving the liquid and solid materials that are pumped from septic tanks, portable toilets, and grease traps, at the WPCS;
- tertiary treatment, which would remove additional suspended solids from the WPCS final effluent to reduce loadings to the Cuyahoga River;
- effluent pumping, which would provide protection to WPCS process equipment that could be damaged by flooding during high flow periods in the Cuyahoga River;
- disinfection improvements, which could possibly increase the efficiency during wet weather events of the process that reduces bacterial and fecal coliform concentrations in the WPCS final effluent; and
- post aeration, which would eliminate the minor dissolved oxygen violations in the WPCS final effluent.

4.4 Ultimate Integrated Plan Alternatives

Five ultimate integrated plan alternatives were developed as part of the Long-Term Control Plan '98 to integrate the CSO control technologies considered viable for Akron's collection system, improvements at the WPCS, and stream restoration: sewer separation, storage/conveyance tunnels, detention basins, retention tanks, post-aeration, disinfection, infiltration/inflow elimination, and non-traditional. From a water quality perspective, Ultimate Integrated Plan Alternatives Nos. 2 thru 5

were designed to achieve the same relative water quality impacts. Each ultimate integrated plan alternative summarized below was made up of some combination of these technologies. The capital costs given for each plan includes preliminary engineering, construction, construction inspection, construction engineering, and interest on bond anticipation notes, and are in 1998 dollars.

- Plan No. 1
  - WPCS Retention Basins
  - WPCS Disinfection
  - WPCS Post-Aeration
  - Rack 40/31 Storage Basin
  - Sewer Separation (34 Racks)
  - Little Cuyahoga River Stream Restoration
  - Cuyahoga River Re-Aeration Structures
  - Infiltration/Inflow Elimination
  - **Capital Cost = $1,071,667,300**

- Plan No. 2
  - WPCS Retention Basins
  - WPCS Disinfection
  - WPCS Post-Aeration
  - Rack 40/31 Storage Basin
  - Ohio Canal Interceptor Tunnel (9 Racks)
  - Northside Interceptor Tunnel (4 Racks)
  - 5 Storage Basins (6 Racks)
  - 5 Treatment Basins (8 Racks)
  - Sewer Separation (7 Racks)
  - Little Cuyahoga River Stream Restoration
  - Cuyahoga River Re-Aeration Structures
  - Infiltration/Inflow Elimination
  - **Capital Cost = $248,055,800**

- Plan No. 3
  - WPCS Retention Basins
  - WPCS Disinfection

WPCS Post-Aeration
Rack 40/31 Storage Basin
Ohio Canal Interceptor Tunnel (9 Racks)
9 Storage Basins (10 Racks)
5 Treatment Basins (8 Racks)
Sewer Separation (7 Racks)
Little Cuyahoga River Stream Restoration
Cuyahoga River Re-Aeration Structures
Inflow/Infiltration Elimination
Capital Cost = $226,524,800

- Plan No. 4

WPCS Retention Basins
WPCS Disinfection
WPCS Post-Aeration
Rack 40/31 Storage Basin
Northside Interceptor Tunnel (4 Racks)
7 Storage Basins (8 Racks)
8 Treatment Basins (13 Racks)
Sewer Separation (9 Racks)
Little Cuyahoga River Stream Restoration
Cuyahoga River Re-Aeration Structures
Inflow/Infiltration Elimination
Capital Cost = $184,684,300

- Plan No. 5

WPCS Retention Basins
WPCS Disinfection
WPCS Post-Aeration
Rack 40/31 Storage Basin
11 Storage Basins (12 Racks)
8 Treatment Basins (13 Racks)
Sewer Separation (9 Racks)
Little Cuyahoga River Stream Restoration

Cuyahoga River Re-Aeration Structures

Inflow/Infiltration Elimination

Capital Cost = $163,153,300

4.5 Evaluation Methodology

The Ultimate Integrated Plan Alternatives were evaluated using decision making computer software (Criterium Decision Plus) against the following values:

- Storm Water Impacts;
- Water Quality Improvements;
- Operation and Maintenance;
- Costs;
- Public Acceptance;
- Community Improvements; and
- Construction Issues.

The results of the evaluation, which are shown on Figure 4-1, of the evaluation were as follows:

Alternative No. 2 - 67.9% acceptable

Alternative No. 3 - 61.4% acceptable

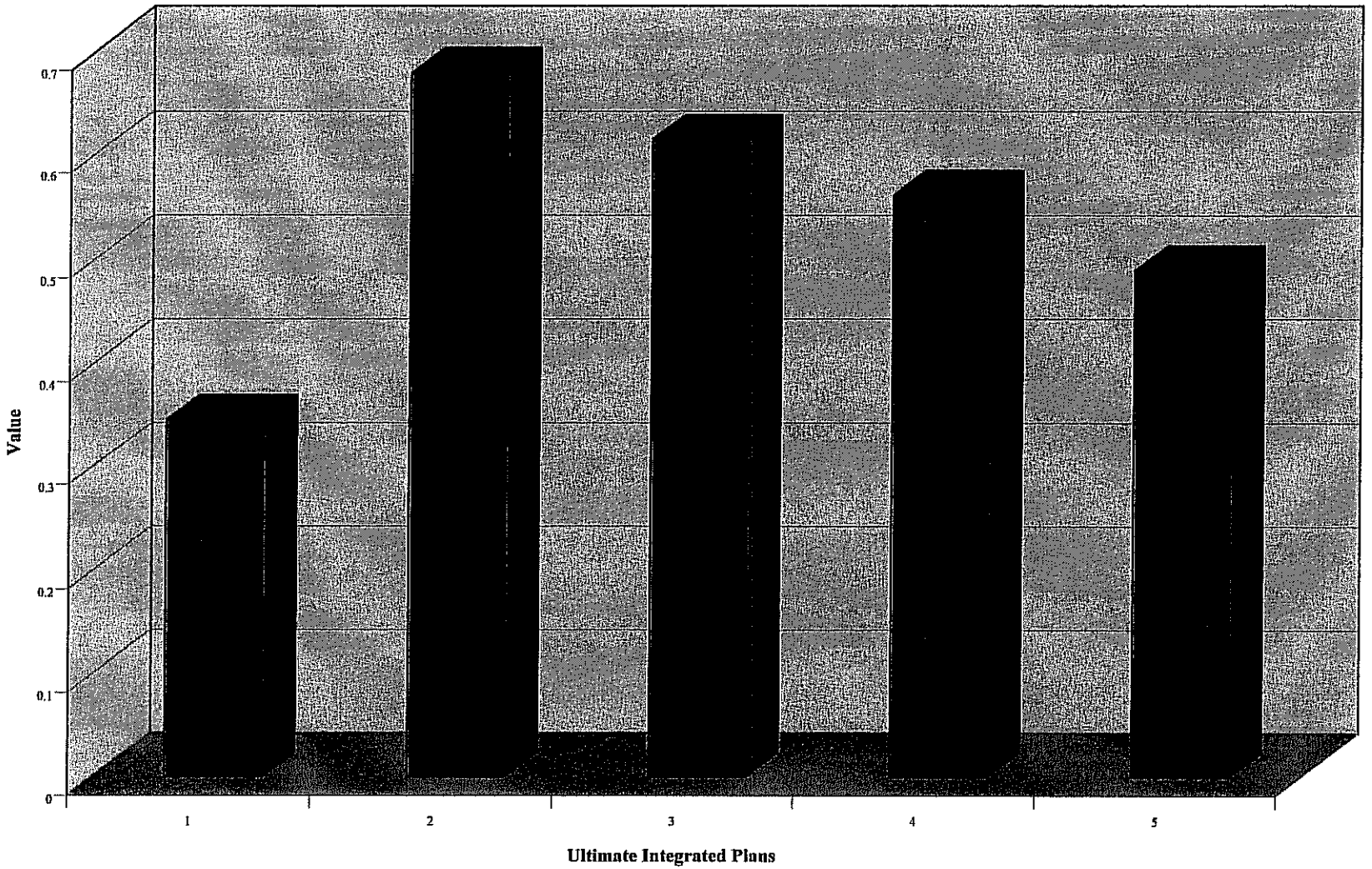
Alternative No. 4 - 56.0% acceptable

Alternative No. 5 - 48.9% acceptable

Alternative No. 1 - 34.5% acceptable

Ultimate Integrated Plan Alternative No. 2 was recommended as the selected plan.

Figure 4-1
Ranking of Ultimate Integrated Plans



4.6 Selected Ultimate Integrated Plan

Based on the results of the decision making computer software (Criterium Decision Plus) Ultimate Integrated Plan No. 2 was selected. The main components of Ultimate Integrated Plan No. 2 are shown in Table 4-1 and on Figures 4-2 and 4-3.

The benefits of the Ultimate Integrated Plan No. 2 are as follows:

Ohio Canal Interceptor Tunnel

- addresses several of the largest annual CSO volumes;
- removes visible debris (floatables, etc.) and odor problems from downtown (Lock 2 Park/Canal Park) Ohio Canal area;
- promotes economic development/public relations;
- replaces failing infrastructure which may need rehabilitation within 10 years;
- reduces O&M by eliminating the Ohio Canal Interceptor north of the innerbelt (from the Power Plant to North Street;
- improve control and reduce monitoring of overflows by combining 9 existing rack overflows into one overflow location; and
- reduces the potential for North Street flooding.

Northside Interceptor Tunnel

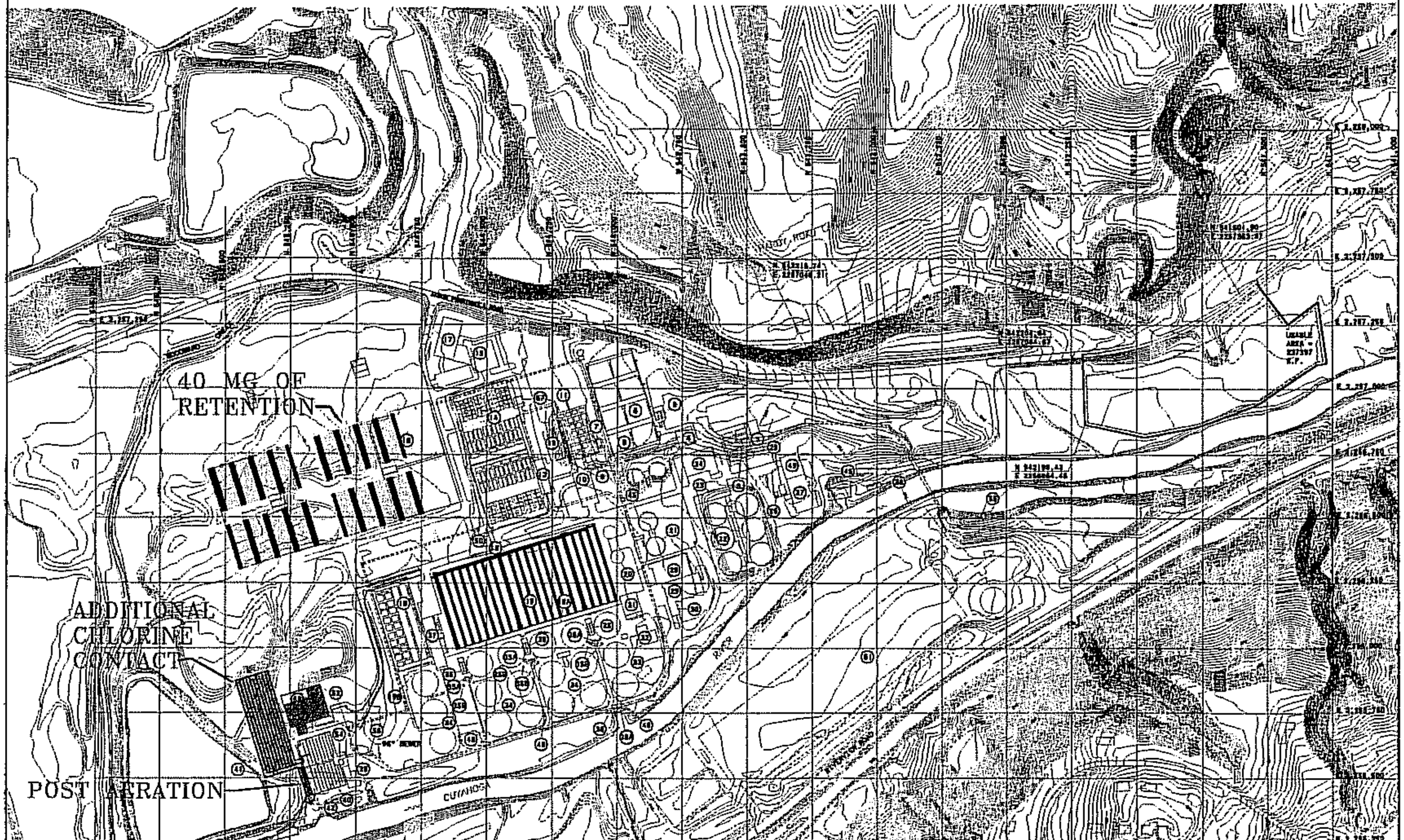
- eliminates the existing Northside Interceptor O&M problems;
- eliminates failing infrastructure;
- removes visible debris (floatables, etc.) and odor problems from the Cascade Valley Park area;
- remove overflows to a State Resource Water (Cuyahoga River in the Gorge Metropolitan Park);
- improve control and reduce monitoring of overflows by combining 4 existing rack overflows into one overflow location; and
- support from environmental groups.

TABLE 4-1

ULTIMATE INTEGRATED PLAN ALTERNATIVE NO. 2

Item	Description	Comments
Rack 2-N	N/A	No overflow in 1994 precipitation year*
Rack 2-S	N/A	No overflow in 1994 precipitation year*
Rack 3	Treatment Basin	
Rack 4	OCI Tunnel	
Rack 5	Storage Basin	Combined with Rack 7
Rack 6	N/A	No overflow in 1994 precipitation year
Rack 7	Storage Basin	Combined with Rack 5
Rack 8	Separation	
Rack 9	Separation	
Rack 10	Treatment Basin	Combined with Rack 11
Rack 11	Treatment Basin	Combined with Rack 10
Rack 12	Treatment Basin	
Rack 13	Separation	
Rack 14	Storage Basin	
Rack 15	Storage Basin	
Rack 16	OCI Tunnel	
Div. Ch./Rack 17	OCI Tunnel	
Rack 18	OCI Tunnel	
Rack 19	OCI Tunnel	
Rack 20	OCI Tunnel	
Rack 21	Separation	Area along East Market Street to OCI Tunnel
Rack 22	Storage Basin	75 Acres to be Separated
Rack 23	OCI Tunnel	
Rack 24	OCI Tunnel	
Rack 25	Separation	
Rack 26	Treatment Basin	Combined with Rack 28
Rack 27	Treatment Basin	Combined with Rack 29
Rack 28	Treatment Basin	Combined with Rack 26
Rack 29	Treatment Basin	Combined with Rack 27
Rack 30	Separation	
Rack 31	Storage Basin	Combined with Rack 40
Rack 32	NSI Tunnel	
Rack 33	NSI Tunnel	
Rack 34	NSI Tunnel	
Rack 35	NSI Tunnel	
Rack 36	Storage Basin	
Rack 37	OCI Tunnel	
Rack 39	Separation	
Rack 40	Storage Basin	Combined with Rack 31
WPCS	Additional Retention	
WPCS	Disinfection Improvements	
WPCS	Post-Aeration Facilities	
Other	Non-Traditional	

Note: The "No overflow in 1994 precipitation year" is from the model of the collection system.



LEGEND

1. INFLUENT CHAMBER
2. INFLUENT SCREENING
3. GRIT REMOVAL COMPLEX
4. TRAINING FACILITY
5. STORM RETENTION INFLUENT
6. STORM RETENTION TANKS
7. STORM RETENTION EFFLUENT
8. RECYCLE WATER FLUME
9. BYPASS JUNCTION CHAMBER
10. SERVICE BUILDING
11. PREAERATION TANKS
12. CHEMICAL HANDLING AND BLOWER BUILDING
13. PRIMARY CONTROL BUILDING
14. PRIMARY SETTLING TANKS
15. LABORATORY BUILDING
16. DECANT BASINS
17. ADMINISTRATION BUILDING
18. AERATION INFLUENT FLUME
19. AERATION TANKS
19A. AERATION GALLERY
19B. AERATION GALLERY TANK NO. 6
20. LIME STABILIZATION PLANT
21. GRAVITY THICKENERS
22. MIXING AND HOLDING TANKS
23. VEHICLE STORAGE BUILDING
24. MAINTENANCE BUILDING AND STOREROOM
25. CHEMICAL STORAGE BUILDING
26. USED OIL STORAGE
27. SLUDGE DISPOSAL BUILDING
28. GRAVITY BELT THICKENER (GBT) BUILDING (OLD DAF BUILDING)
29. ZIMPRO BUILDING
30. STANDBY GENERATOR BUILDING
31. SOUTH BLOWER BUILDING
32. 5KV OUTDOOR SUBSTATION
33. EQUIPMENT STORAGE BUILDING
34. FINAL SETTLING TANKS
35. RETURN SLUDGE SCREW PUMPS
35A. RETURN SLUDGE WELL
35B. GAS METERING CHAMBER
36. BYPASS CHAMBER
36A. 96" BYPASS GATE STATION
37. NORTH BLOWER BUILDING
38. ABANDONED PLANT RIVER WATER PUMPHOUSE
39. CHLORINATION AND PLANT WATER FACILITIES
40. CHLORINE CONTACT TANKS
41. FINAL EFFLUENT MONITORING
42. OUTFALL SEWER
42A. FINAL EFFLUENT OUTFALL
43. RECYCLE WATER EQUALIZATION TANK
45. PLANT UTILITY ACCESS ROAD
46. FINAL SETTLING TANK EFFLUENT MONITORING
47. MIXING AND BLENDING TANKS
50. PRIMARY EFFLUENT SAMPLE BUILDING
51. COMPOST FACILITY
52. SECONDARY BYPASS MANHOLE
54. FLASH MIXER
55. COMBUSTIBLE GAS ANALYZER BUILDING
56. FINAL EFFLUENT SAMPLE STATION
57. GENERATOR BUILDING
58. DECHLORINATION AND GENERATOR BUILDING

40 MG OF RETENTION
ADDITIONAL CHLORINE CONTACT
POST AERATION

AKRON FACILITIES PLAN '98

FIGURE 4–3
RECOMMENDED AKRON WPCS IMPROVEMENTS

Detention Basins

- addresses largest CSO annual volume and OEPA primary concern (Rack 40);
- reduces visible debris by capturing floatables and odors;
- provides primary clarification (treatment basin); and
- provides disinfection (treatment basin).

Sewer Separation

- used only where economically feasible;
- used only where storm water impacts are minimum (i.e., residential); and
- reduces O&M/monitoring by removing racks.

Non-Traditional Stream Improvements

- aesthetic improvements for the stream;
- support from environmental groups and OEPA;
- minimal O&M; and
- public can see and use the improvements.

WPCS Improvements

- reduces secondary bypasses and their water quality impacts; and
- reduces the risk of DO and fecal noncompliance;
- allows for the dewatering of the collection system tunnels and basins without adversely affecting the operation of the WPCS.

Actual water quality benefits will be measured over time. In the event that it is determined that water quality standards will not be achieved even after the implementation of all aspects of the Long-Term Control Plan, the City of Akron will consider a water quality standard variance, as contemplated under the U.S. EPA CSO Control Policy and the Ohio EPA CSO Strategy. Specifically, the Ohio EPA Strategy states as follows:

"Ohio EPA will meet with communities as they develop their long-term control plans to discuss cases where changes to water quality standards may be appropriate to better address wet weather conditions. Site specific changes to water quality criteria, changes to a receiving water's use designation, or a water quality standard variance can be considered as allowed by Ohio's Water Quality Standards..."

It is also essential to keep in mind that the purpose of this Long-Term Control Plan is to address impacts from CSOs. As set forth in Section 2.9, existing data demonstrates that there are significant water quality impacts upstream of the CSO area, which impacts are clearly no the result of discharges associated with the City of Akron's CSOs. The City of Akron has prepared this Long-Term Control Plan, and will implement the projects contemplated herein, based upon the assumption that Ohio EPA will fully cooperate with the City of Akron with regard to requests for water quality standard variances and/or use designation modifications, as indicated in the Ohio EPA's CSO Strategy. It is also contemplated that the Ohio EPA will take additional steps, as appropriate, to address upstream and non-CSO sources that contribute to the degradation of in-stream conditions.

A comparison of the performance of Ultimate Integrated Plan No. 2 to the existing combined sewer system is presented in Tables 4-2 to 4-5. The following is a summary of the comparison of the performance of Ultimate Integrated Plan No. 2 to the existing combined sewer system.

Number of Combined Sewer Overflows

Location	Existing Conditions	Integrated Alternative #2	Percent Reduction
Collection System	1,044	100	90
WPCS Secondary Bypass	27	6	78
Overall	1,071	106	90

Hours of CSO

Location	Existing Conditions	Integrated Alternative #2	Percent Reduction
Collection System	2,754	340	88
WPCS Secondary Bypass	461	311	33
Overall	3,215	651	80

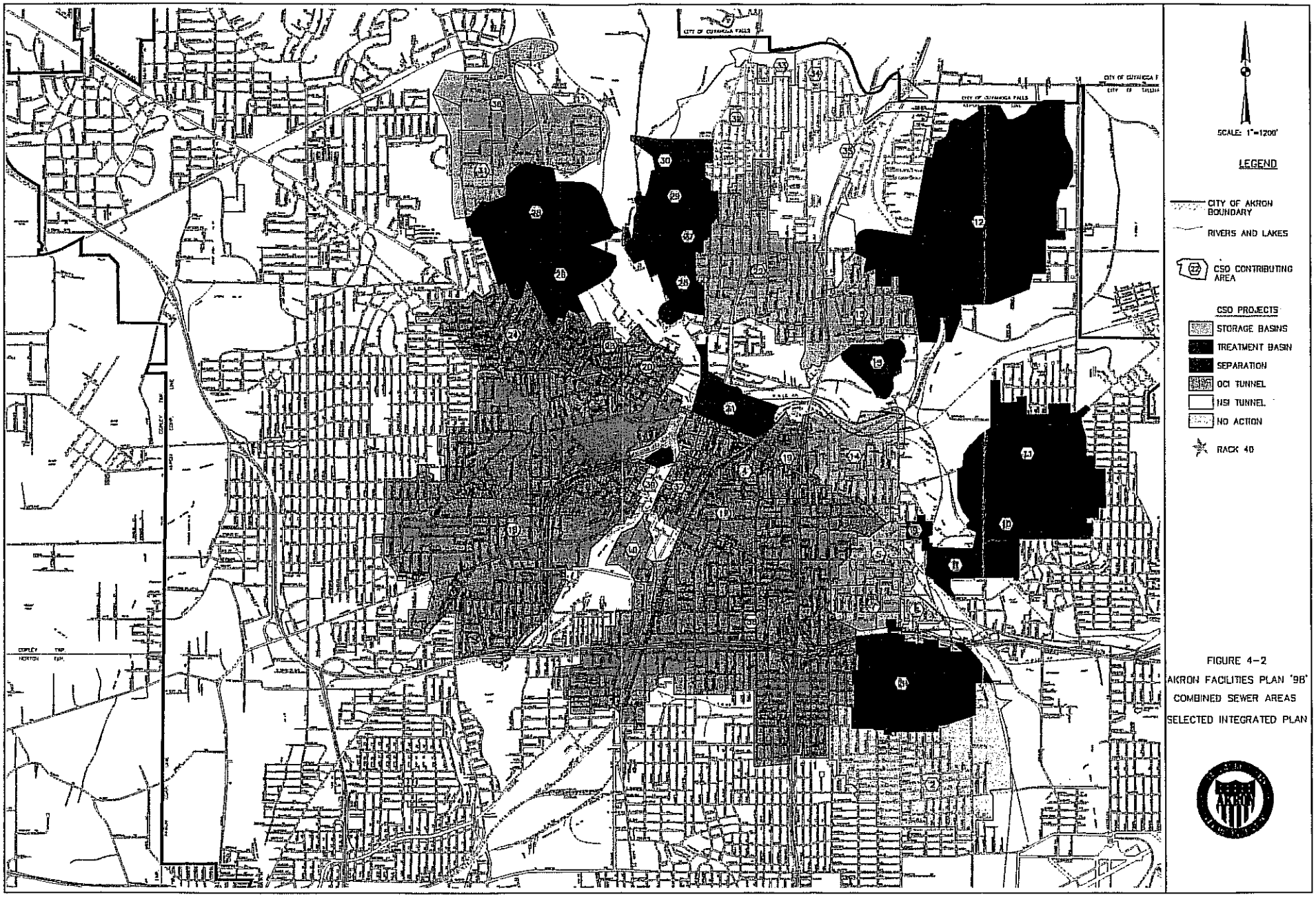


FIGURE 4-2
AKRON FACILITIES PLAN '98'
COMBINED SEWER AREAS
SELECTED INTEGRATED PLAN

Volume of CSO

Location	Existing Conditions	Integrated Alternative #2	Percent Reduction
Collection System	1,240	454	63
WPCS Secondary Bypass	1,200	912	24
Overall	2,440	1,366	44

CBOD Loading of CSO

Location	Existing Conditions	Integrated Alternative #2	Percent Reduction
Collection System	776,366	309,530	60
WPCS Secondary Bypass	300,300	228,391	24
Overall	1,076,666	537,921	50

A summary of the performance of Ultimate Integrated Plan No. 2 is as follows:

- The biggest reductions are in the number of combined sewer overflows and hours of combined sewer overflow for the collection system, which would be reduced by 90 and 88 percent, respectively.
- The volume of combined sewer overflow would be reduced by 63 percent, and this could be higher in a more typical precipitation year. The analysis year of 1994 was typical from a total rainfall amount, but it had an above average number of large storm events that would impact the volume of combined sewer overflow. A large storm event would have a larger rainfall volume falling over a given time frame, which would quickly overwhelm the collection system and WPCS, and generate more overflow volume. Substituting several smaller events for the larger events would mean less rainfall volume in a given time frame, which would hypothetically increase the capture rate of the collection system and WPCS.
- The WPCS Secondary Bypass would not benefit as much as the collection system would from the improvements. This is because the hydraulic model of the collection system was set to totally dewater (return stored flow to the collection system) the tunnels and detention basins within 24 hours from the end of the storm event. This

- extends the number of hours of high flows to the WPCS, and without the new additional storm retention would have increased the amount of secondary bypass. Actual operation of the collection system improvements will involve close coordination between WPCS and collection system operations to lessen the dewatering impacts. This can be accomplished by increasing the dewatering time or delaying the start of the dewatering process to reduce the impact on the WPCS.

In addition, the Long-Term Control Plan is required to meet the 85 percent capture goal. Ultimate Integrated Plan No. 2 exceeds this criteria. The general calculation, which is based on the definitions stated in Section 4.1 (Detailed discussion of this calculation appears below), is as follows:

Annual Volume of Storm Flow **= 7,257 Mgal**
(Flow above ADF of 76.5 mgd at WPCS, from Hydraulic Model)

Annual Overflow Volume (from Table 4-2) **= 454 Mgal**

Percent Capture = Annual Volume of Storm Flow/ (Annual Overflow Volume + Annual Volume of Storm Flow)

Percent Capture = 7,257 Mgal/(454 + 7,257) = 94%

Detailed Derivation Of Percent Capture

The CSO Policy (or guidance) gives us the following definition of the Presumption Approach:

> *"The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis..."*

For the calculations of the City of Akron's Annual Percent Capture, the following were assumed.

- "Treatment" is defined as primary (or greater) treatment. Therefore, all influent to the WPCS (including secondary bypass) and all TREATED overflow from Treatment Basins in Alternative 2 is counted as being "captured for treatment" (CFT).
- Combined sewage is any flow that is a mix of stormwater and sanitary flow.

- A precipitation event is defined as occurring when inflow to the WPCS exceeds the annual daily average inflow rate.

These definitions were used in estimating the annual percent capture for Ultimate Integrated Alternative 2.

General Calculation

We used the following fundamental calculation to estimate Annual Percent Capture:

$$\text{Percent Capture} = \frac{V_{CFT}}{V_{TOTAL}}$$

Where,

V_{CFT} = CFT as defined above which includes the treated volume discharged from upsystem treatment basins under Ultimate Integrated Alternative 2.

$V_{OVERFLOW}$ = the annual sum of all the **untreated** overflows from the combined sewer system including overflows from storage basins, treatment basins, and tunnels in Alternative 2.

V_{TOTAL} = $V_{CFT} + V_{OVERFLOW}$

Each of the required volume estimates were obtained from continuous annual model simulations of the typical precipitation year (1994) for Akron.

Specific Calculation for Ultimate Integrated Alternative 2

A summary of the configuration of Ultimate Integrated Alternative 2 is shown in Table 4-2 on Page 4.19. This table shows the Alternative 2 technology for each rack in the system.

Each of the terms in the percent capture calculation ($V_{OVERFLOW}$, V_{CFT}, and V_{TOTAL}) for Ultimate Integrated Alternative 2 are described below.

Volume of Untreated Overflow ($V_{OVERFLOW}$)

Volume of untreated overflow for each of the upsystem CSO points was tracked on an hourly basis in the continuous annual model simulation. The results for each CSO point are shown in Table 4-2. The total annual untreated overflow volume for the system under Alternative 2 is 454.4 Mgal.

Untreated overflow occurs at the storage basins and tunnels when the storage volume of these

facilities is exceeded. This can occur during a single storm of sufficient magnitude, or during a sequence of smaller storms that cannot be individually dewatered during inter-event periods.

Untreated overflows occur at treatment basins when the design peak flow rate of the facility is exceeded. This means that long duration, low intensity storms have the potential to be treated in full, while short duration, high intensity storms may result in an untreated overflow. During overflow conditions at a treatment basin, only that increment of the inflow above the design peak flow rate results in untreated overflow.

Volume of Treated Flow (V_{CFT})

In order to calculate the WPCS component of V_{CFT}, the annual predicted inflow hydrograph to the WPCS was analyzed on a per hour basis. Whenever the inflow rate increased above the annual average flow rate of 76.5 MGD (118.4 cfs)[1], the beginning of a precipitation event was established and the calculation of treated volume was initiated. This calculation continued until the WPCS inflow rate dropped back below 76.5 mgd. One storm is shown in detail on Figure 4.4 as an example of this process.

This WPCS V_{CFT} calculation process was performed for the full typical precipitation year. The results are shown graphically in Figure 4.5 through 4.16 on a per month basis. These graphs show the predicted WPCS inflow hydrograph, and identify the precipitation periods during which the V_{CFT} calculation was performed. Table 4-6 summarizes the numerical WPCS V_{CFT} results presented on the graphs on a per month basis.

This total annual WPCS V_{CFT} was presented in the preliminary calculations of annual percent capture for Ultimate Integrated Alternative 2.

The total V_{CFT} for the annual percent capture calculation can also take credit for the V_{CFT} from the upsystem treatment basins. Given the configuration of Ultimate Integrated Alternative 2, this volume is relatively small. However, the volume of treated flow for each of the five upsystem treatment basins was tracked on an hourly basis in the continuous annual model simulation. This total annual treatment basin V_{CFT} is 89 Mgal. Table 4-7 extracts the reduction in volume from Table 4-2 for the treatment basins to show the calculation of this amount.

Total Volume (V_{TOTAL})

The total volume is the sum of the untreated overflow volume and the treated flow volume:

$$V_{TOTAL} = 454 + (7257+89) = 7800 \text{ Mgal}$$

1 76.5 MGD is the calculated annual average daily flow based on the simulation of the 1994 precipitation year as described in Table 8-6 of the 1998 CSO System Wide Study Submitted to Ohio EPA December 15, 1998.

Resulting Annual Percent Capture

The Annual Percent Capture for Ultimate Integrated Alternative 2 resulting from the above volume estimates is as follows:

Annual Percent Capture = (7257+89)/7800 = 94 percent.

Table 4-6
Monthly V_{CFT} at the WPCS for Percent Capture Calculation Based on Model Results for Typical Precipitation Year.

Month	**V_{CFT} (Mgal)**
January	486.88
February	109.15
March	240.80
April	1806.39
May	261.05
June	456.27
July	1170.98
August	1317.61
September	339.31
October	105.65
November	377.60
December	585.77
Total	**7257 Mgal**

Table 4-7
Volume Treated at Treatment Basins

Treatment Basin	**V_{CFT} (Mgal) Annual Reduction**
Rack 27 & 29	9.7
Rack 26 & 28	22.5
Rack 12	34.4
Rack 10 & 11	10
Rack 3	12.6
Total	**89 Mgal**

TABLE 4-2
Existing Conditions vs. Ultimate Integrated Alternative 2
1994 Precipitation Year - Annual CSO Volume
(Based on predictions from the Hydraulic Collection System Model)

Rack ID	Existing Overflow Volume (Mgal)	Alternative 2 Technology	Alternative 2 Untreated Overflow Volume (Mgal)	Reduction in Volume (Mgal)	Percent Reduction
40 & 31	461.1	Storage Basin	145.1	316.0	68.5%
36	7.8	Storage Basin	3.9	3.9	50.4%
NSI Tunnel 32, 33, 34, 35	67.2	Storage Tunnel	24.1	43.1	64.2%
27 & 29	13.8	Treatment Basin	4.1	9.7	70.2%
26 & 28	23.8	Treatment Basin	1.2	22.5	94.7%
22[2]	11.3	Storage Basin	7.5	3.8	34.0%
OCI Tunnel 4, 16, 17, DC, 18, 19, 20, 23, 24 & 37	521.6	Storage Tunnel	238.6	283.0	54.3%
15	14.9	Storage Basin	4.3	10.6	71.1%
14	27.5	Storage Basin	3.5	23.9	87.1%
12	44.2	Treatment Basin	9.8	34.4	77.8%
10 & 11	14.7	Treatment Basin	4.7	10.0	68.2%
5 & 7	6.2	Storage Basin	4.2	2.0	32.8%
3	16.0	Treatment Basin	3.4	12.6	78.9%
8	2.9	Separation	0.0	2.9	100.0%
9	0.2	Separation	0.0	0.2	100.0%
13	0.6	Separation	0.0	0.6	100.0%
21[3]	1.3	Separation	0.0	1.3	100.0%
25	1.2	Separation	0.0	1.2	100.0%
30	4.1	Separation	0.0	4.1	100.0%
39	0.0	Separation	0.0	0.0	-
Total	1,240.4		454.4	786.0	63.4%
Akron WPCS Secondary Bypass	1,200.0 600	40 Mgal of Additional Storage at WPCS[2]	912.0 456	288.0 144	24.0%
System Totals:	2,440.4		1,366.4	1,074.0	44.0%

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Notes:
(1) Existing Akron WPCS has 10 Mgal of storage.
(2) Approximately 75 acres of largely residential area along North Howard Street is to be separated.
(3) An area along East Market Street from Howard Street east is to be directed to the OCI Tunnel.

TABLE 4-3
Existing Conditions vs. Ultimate Integrated Alternative 2
1994 Precipitation Year - Annual CSO Number of Events[1]
(Based on predictions from the Hydraulic Collection System Model)

Rack ID	Existing Overflow Events[2]	Alternative 2 Technology	Alternative 2 Untreated Overflow Events	Reduction in Events	Percent Reduction
40 & 31	65	Storage Basin	5	60	92.3%
36	34	Storage Basin	8	26	76.5%
NSI Tunnel 32, 33, 34, 35	160	Storage Tunnel	7	153	95.6%
27 & 29	66	Treatment Basin	13	53	80.3%
26 & 28	92	Treatment Basin	6	86	93.5%
22[4]	19	Storage Basin	7	12	63.2%
OCI Tunnel 4, 16, 17, DC, 18, 19, 20, 23, 24 & 37	246	Storage Tunnel	8	238	96.7%
15	44	Storage Basin	8	36	81.8%
14	55	Storage Basin	4	51	92.7%
12	34	Treatment Basin	9	25	73.5%
10 & 11	48	Treatment Basin	7	41	85.4%
5 & 7	42	Storage Basin	8	34	81.0%
3	38	Treatment Basin	10	28	73.7%
8	38	Separation	0	38	100.0%
9	6	Separation	0	6	100.0%
13	10	Separation	0	10	100.0%
21[5]	9	Separation	0	9	100.0%
25	13	Separation	0	13	100.0%
30	25	Separation	0	25	100.0%
39	0	Separation	0	0	-
Total	1,044		100	944	90.4%
Akron WPCS Secondary Bypass	27	40 Mgal of Additional Storage at WPCS[3]	6	21	77.8%
System Totals:	1,071		106	965	90.1%

Notes:
(1) Number of events based on 6-hour inter-event time.
(2) Number of existing overflow hours includes the total hours for all racks grouped for the specific control measure.
(3) Existing Akron WPCS has 10 Mgal of storage.
(4) Approximately 75 acres of largely residential area along North Howard Street is to be separated.
(5) An area along East Market Street from Howard Street east is to be directed to the OCI Tunnel.

TABLE 4-4
Existing Conditions vs. Ultimate Integrated Alternative 2
1994 Precipitation Year - Annual CSO Number of Hours
(Based on predictions from the Hydraulic Collection System Model)

Rack ID	Existing Overflow Hours[1]	Alternative 2 Technology	Alternative 2 Untreated Overflow Hours	Reduction in Overflow Hours	Percent Reduction
40 & 31	317	Storage Basin	98	219	69.1%
36	55	Storage Basin	21	34	61.8%
NSI Tunnel 32, 33, 34, 35	333	Storage Tunnel	26	307	92.2%
27 & 29	189	Treatment Basin	19	170	89.9%
26 & 28	202	Treatment Basin	7	195	96.5%
22[3]	23	Storage Basin	11	12	52.2%
OCI Tunnel 4, 16, 17, DC, 18, 19, 20, 23, 24 & 37	895	Storage Tunnel	80	815	91.1%
15	92	Storage Basin	17	75	81.5%
14	187	Storage Basin	15	172	92.0%
12	53	Treatment Basin	11	42	79.2%
10 & 11	81	Treatment Basin	8	73	90.1%
5 & 7	56	Storage Basin	14	42	75.0%
3	69	Treatment Basin	13	56	81.2%
8	67	Separation	0	67	100.0%
9	7	Separation	0	7	100.0%
13	10	Separation	0	10	100.0%
21[4]	11	Separation	0	11	100.0%
25	16	Separation	0	16	100.0%
30	91	Separation	0	91	100.0%
39	0	Separation	0	0	-
Total	2,754		340	2,414	87.7%
Akron WPCS Secondary Bypass	461	40 Mgal of Additional Storage at WPCS[2]	311	150	32.5%
System Totals:	3,215		651	2,564	79.8%

Notes:

(1) Number of existing overflow hours includes the total hours for all racks grouped for the specific control measure.

(2) Existing Akron WPCS has 10 Mgal of storage.

(3) Approximately 75 acres of largely residential area along North Howard Street is to be separated.

(4) An area along East Market Street from Howard Street east is to be directed to the OCI Tunnel.

TABLE 4-5
Existing Conditions vs. Ultimate Integrated Alternative 2
1994 Precipitation Year - Annual CSO CBOD[1] Load
(Based on predictions from the Hydraulic Collection System Model)

Rack ID	Existing CBOD Load (lbs.)	Alternative 2 Technology	Alternative 2 CBOD Load (lbs.)	Reduction in CBOD Load (lbs.)	Percent Reduction
40 & 31	288,605	Storage Basin	90,833	197,772	68.5%
36	4,869	Storage Basin	2,416	2,453	50.4%
NSI Tunnel 32, 33, 34, 35	42,063	Storage Tunnel	15,076	26,987	64.2%
27 & 29	8,647	Treatment Basin	6,145	2,502	28.9%
26 & 28	14,889	Treatment Basin	6,075	8,814	59.2%
22[3]	7,070	Storage Basin	4,668	2,402	34.0%
OCI Tunnel 4, 16, 17, DC, 18, 19, 20, 23, 24 & 37	326,452	Storage Tunnel	149,359	177,093	54.2%
15	9,317	Storage Basin	2,692	6,625	71.1%
14	17,183	Storage Basin	2,210	14,973	87.1%
12	27,671	Treatment Basin	15,964	11,707	42.3%
10 & 11	9,200	Treatment Basin	5,629	3,571	38.8%
5 & 7	3,900	Storage Basin	2,622	1,278	32.8%
3	10,020	Treatment Basin	5,841	4,179	41.7%
8	1,845	Separation	0	1,845	100.0%
9	115	Separation	0	115	100.0%
13	390	Separation	0	390	100.0%
21[4]	787	Separation	0	787	100.0%
25	754	Separation	0	754	100.0%
30	2,589	Separation	0	2,589	100.0%
39	0	Separation	0	0	-
Total	776,366		309,530	466,836	60.1%
Akron WPCS Secondary Bypass	300,300	40 Mgal of Additional Storage at WPCS[3]	228,391	71,909	23.9%
System Totals:	1,076,666		537,921	538,745	50.0%

Notes:
(1) 5-day carbonaceous biochemical oxygen demand.
(2) Existing Akron WPCS has 10 Mgal of storage.
(3) Approximately 75 acres of largely residential area along North Howard Street is to be separated.
(4) An area along East Market Street from Howard Street east is to be directed to the OCI Tunnel.

Figure 4.4. Calculation of Treated Volume When Inflow to WPCS Above Annual Average

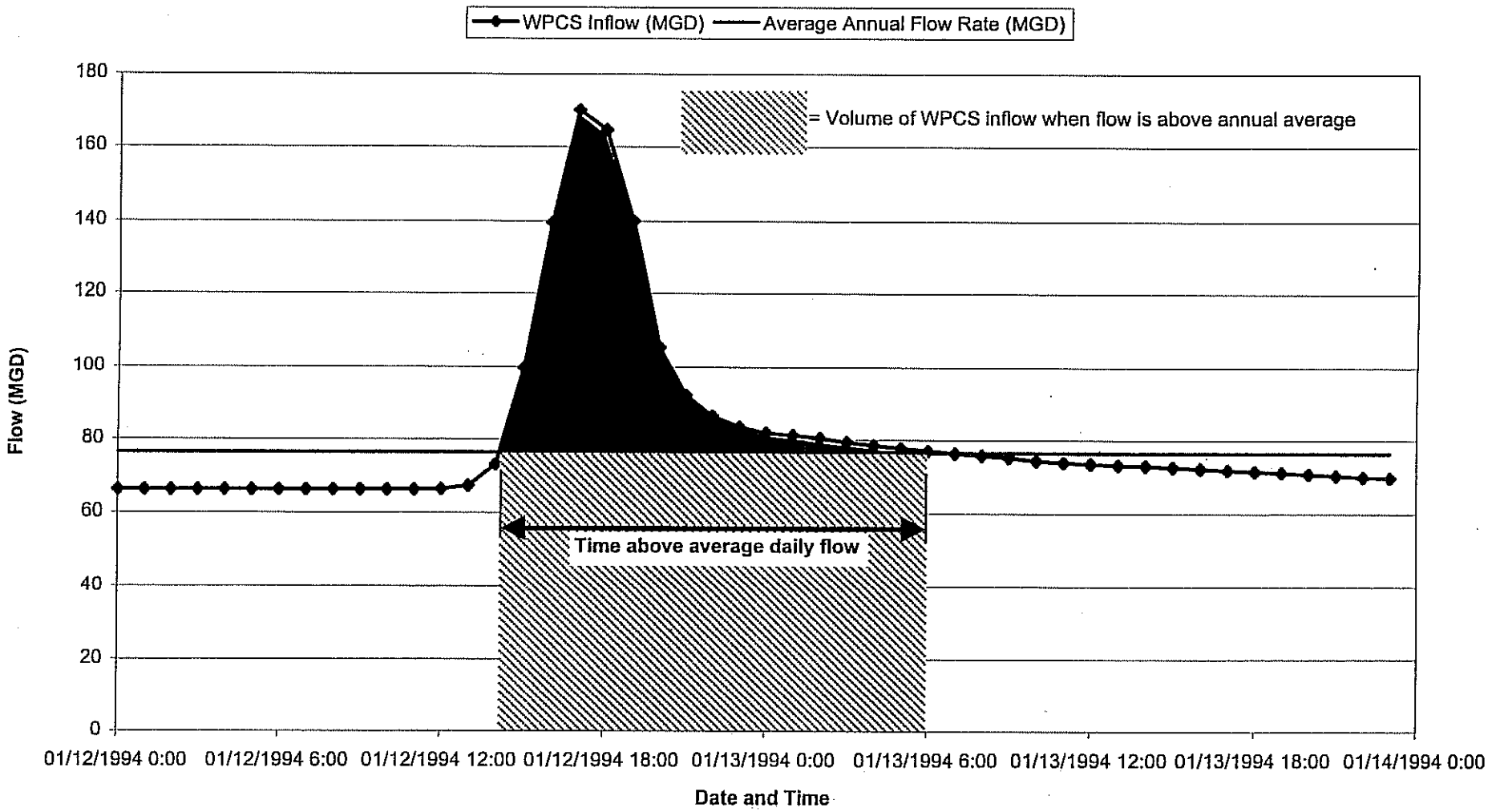


Figure 4.5 Typical Akron Precipitation Year: January
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 486.88 MGal

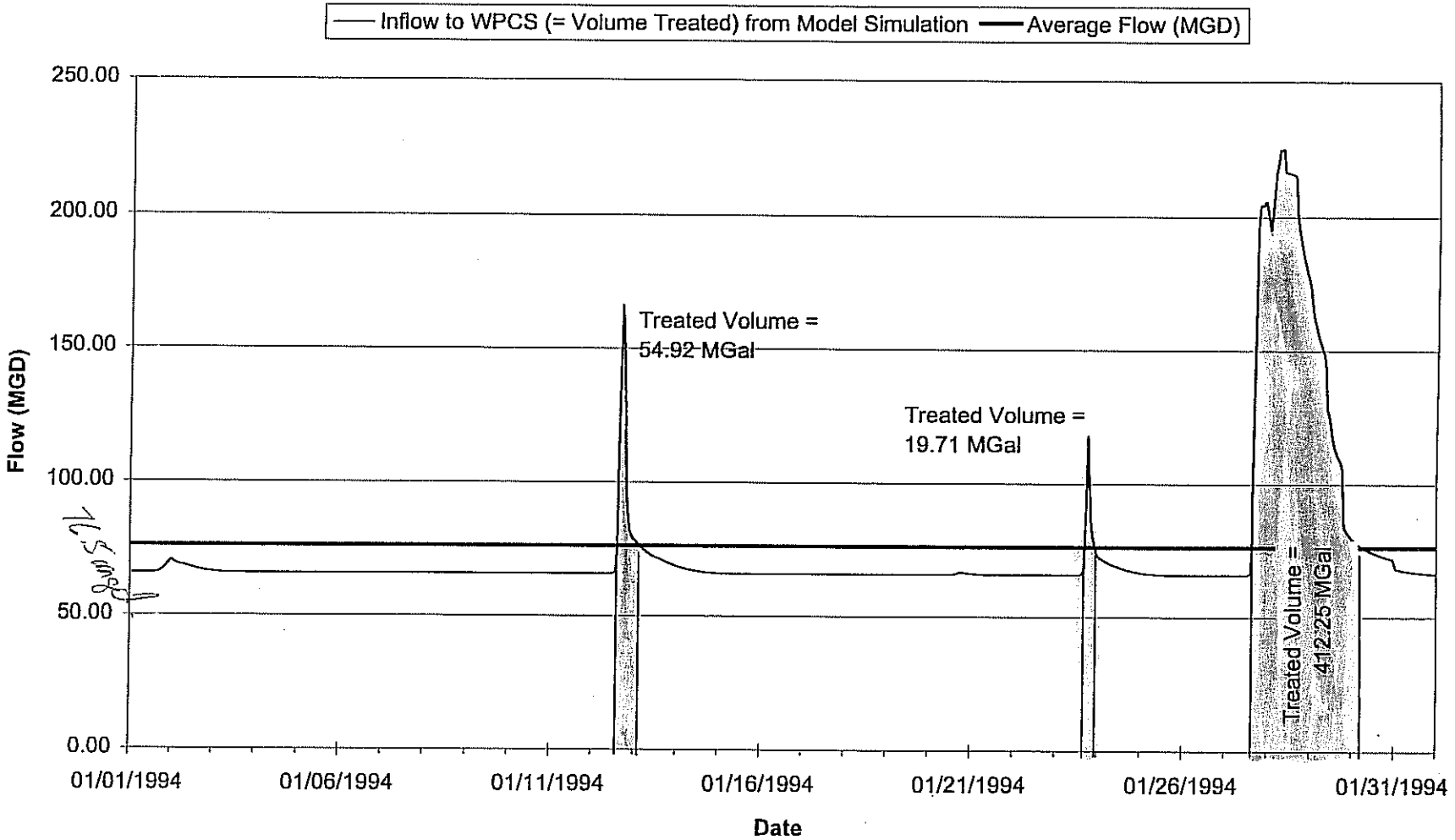


Figure 4.6 Typical Akron Precipitation Year: February
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 109.15 MGal

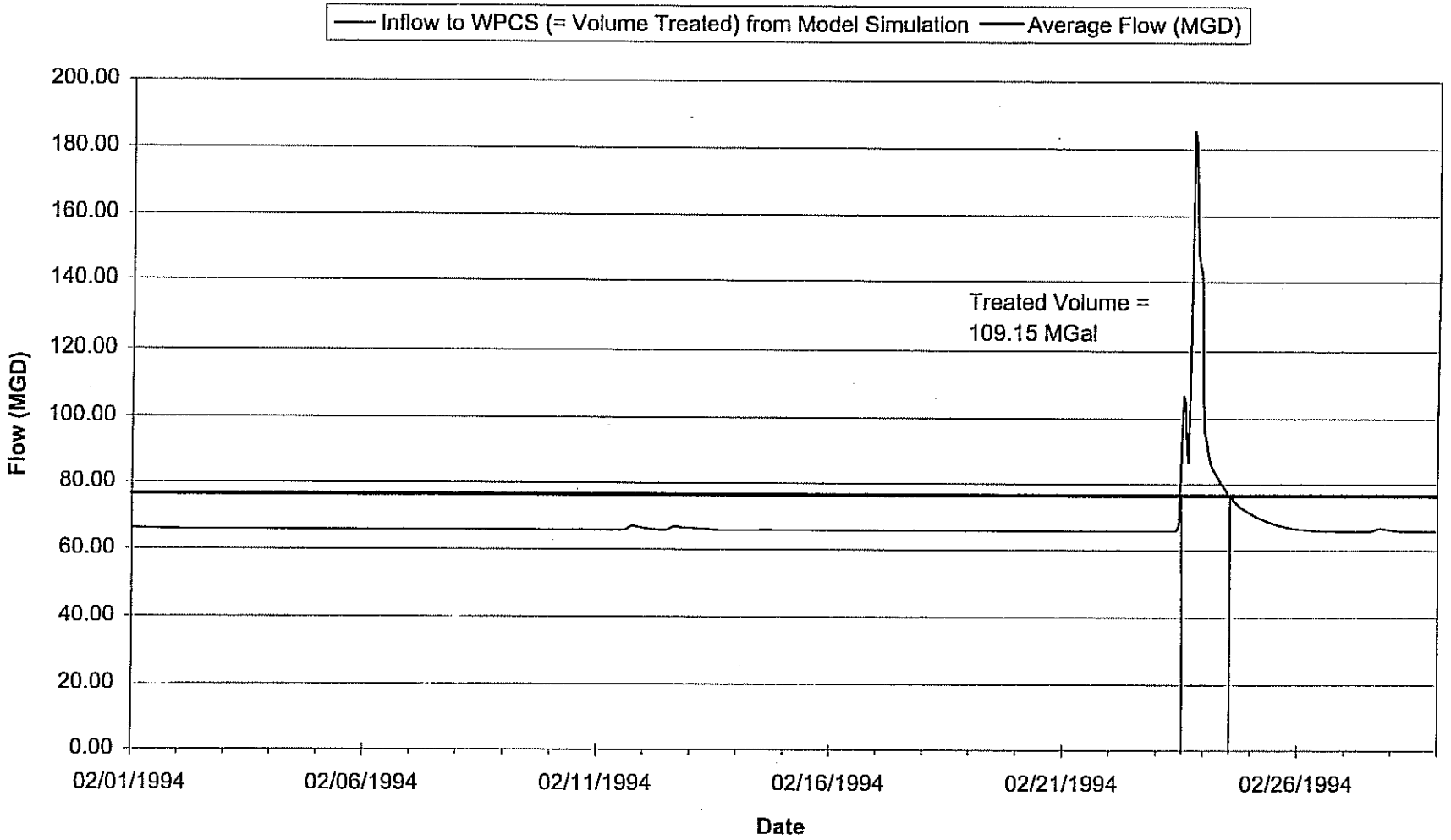


Figure 4.7 Typical Akron Precipitation Year: March
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 240.80 MGal

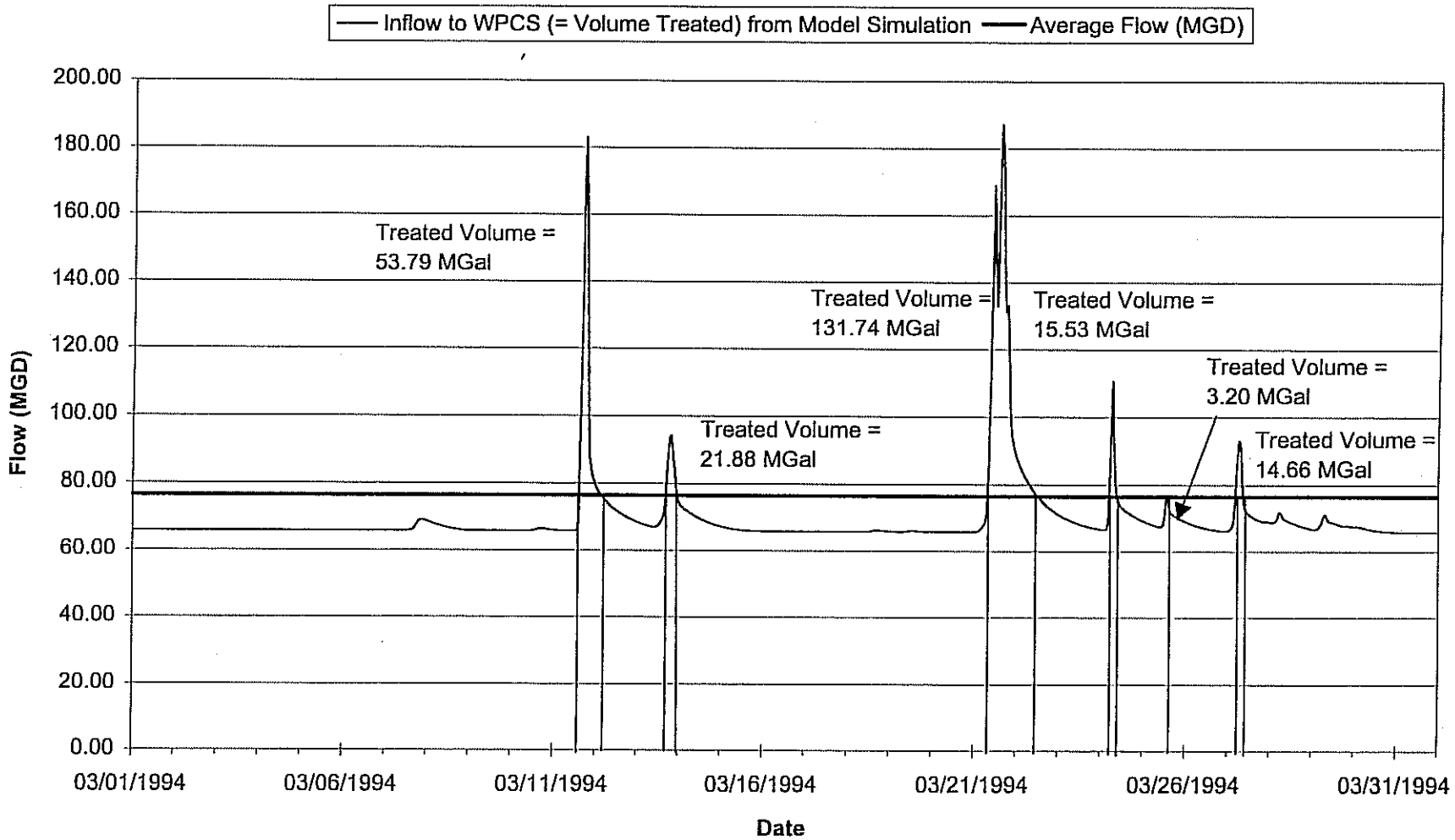


Figure 4.8 Typical Akron Precipitation Year: April
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 1806.39 MGal

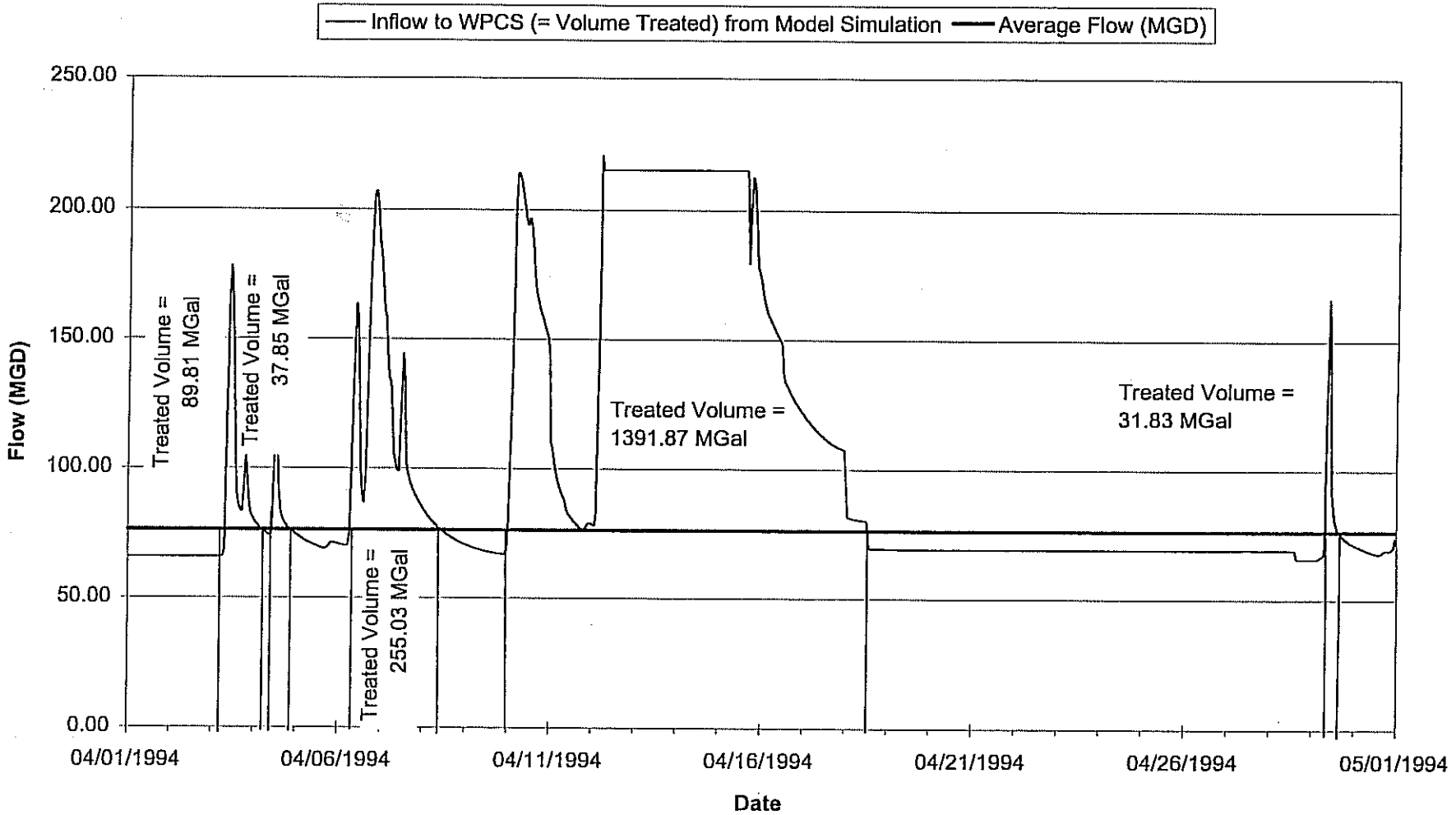


Figure 4.9 Typical Akron Precipitation Year: April
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 261.05 MGal

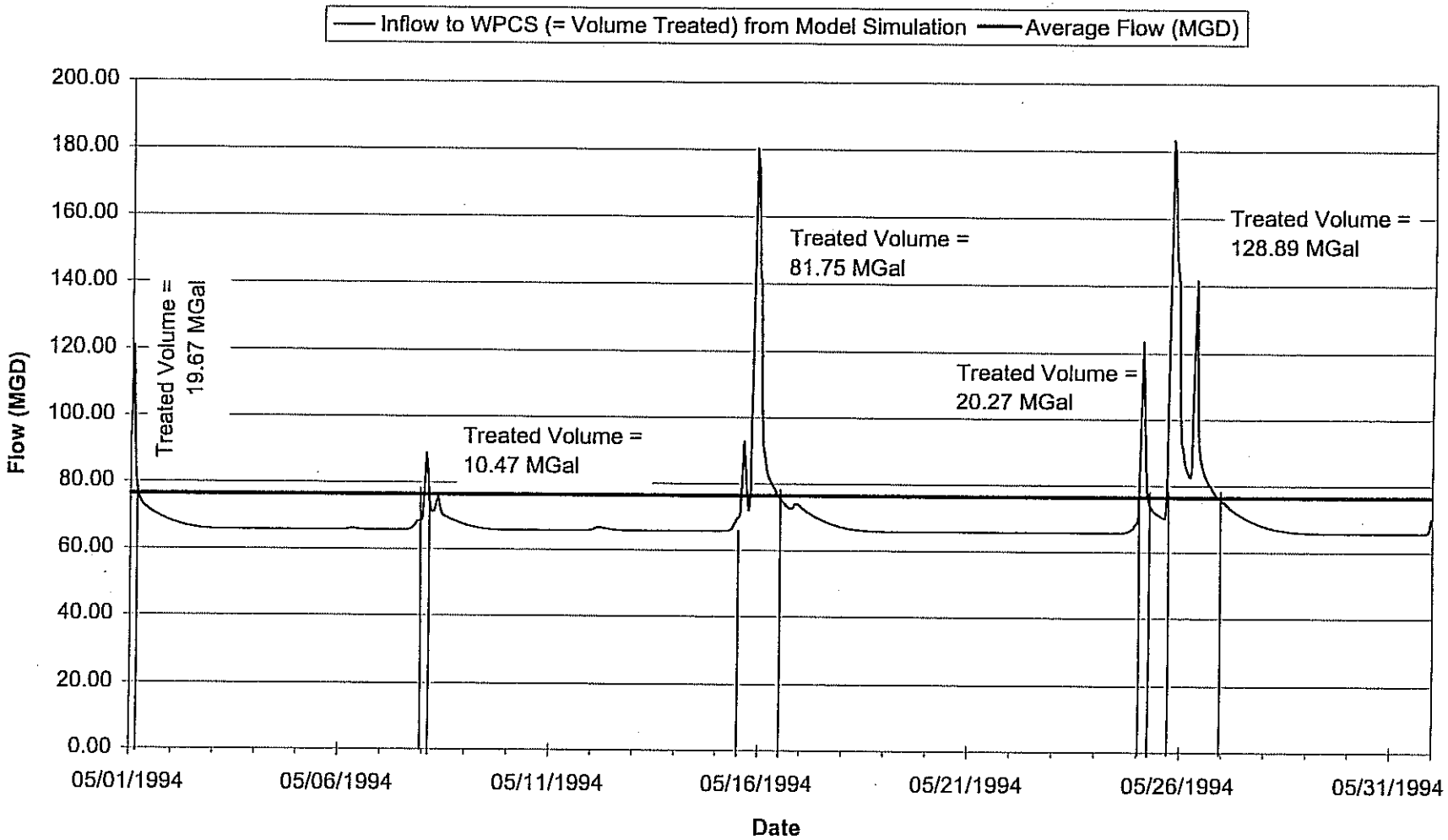


Figure 4.10 Typical Akron Precipitation Year: June
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 456.27 MGal

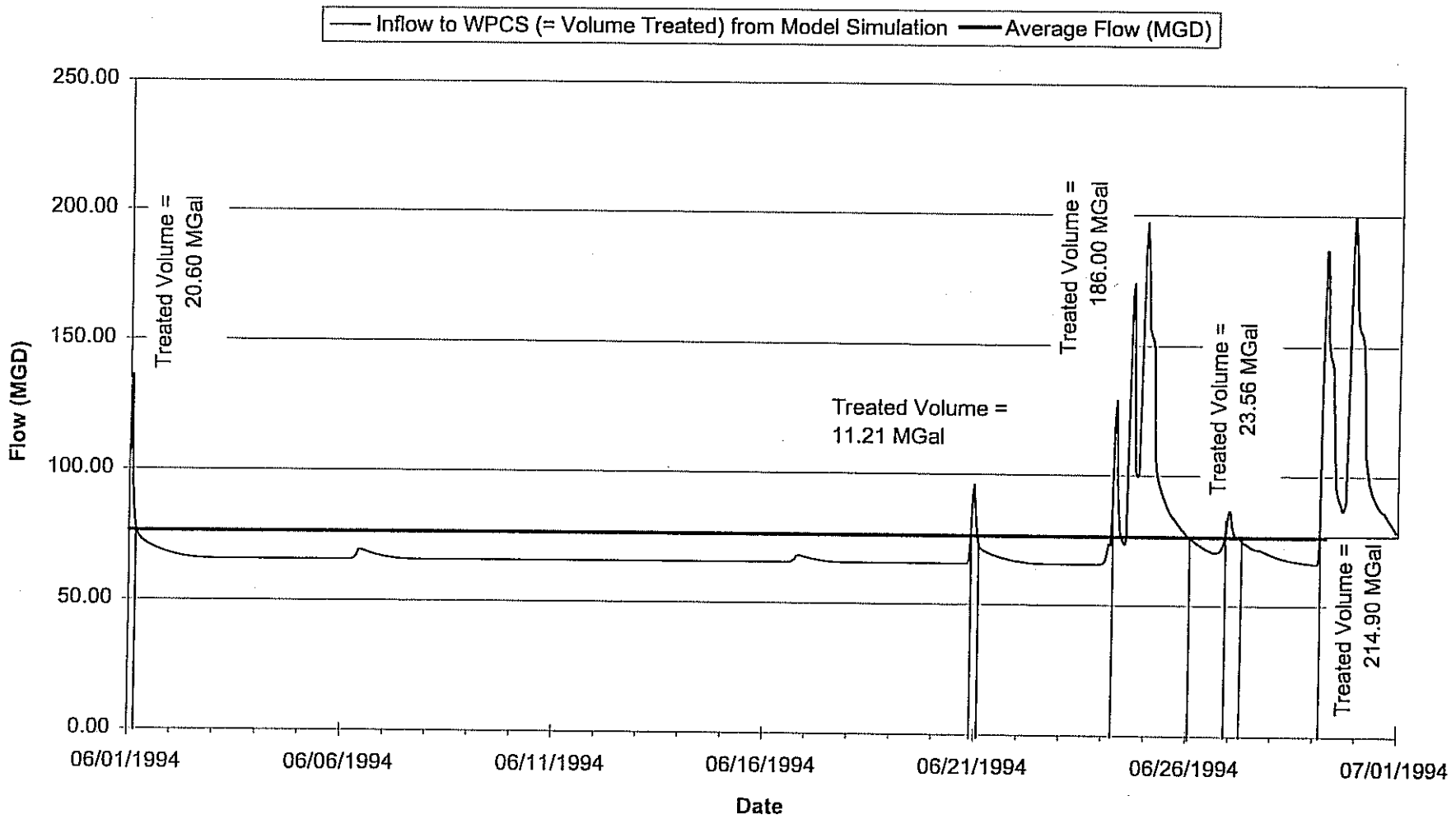


Figure 4.11 Typical Akron Precipitation Year: July
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 1170.98 MGal

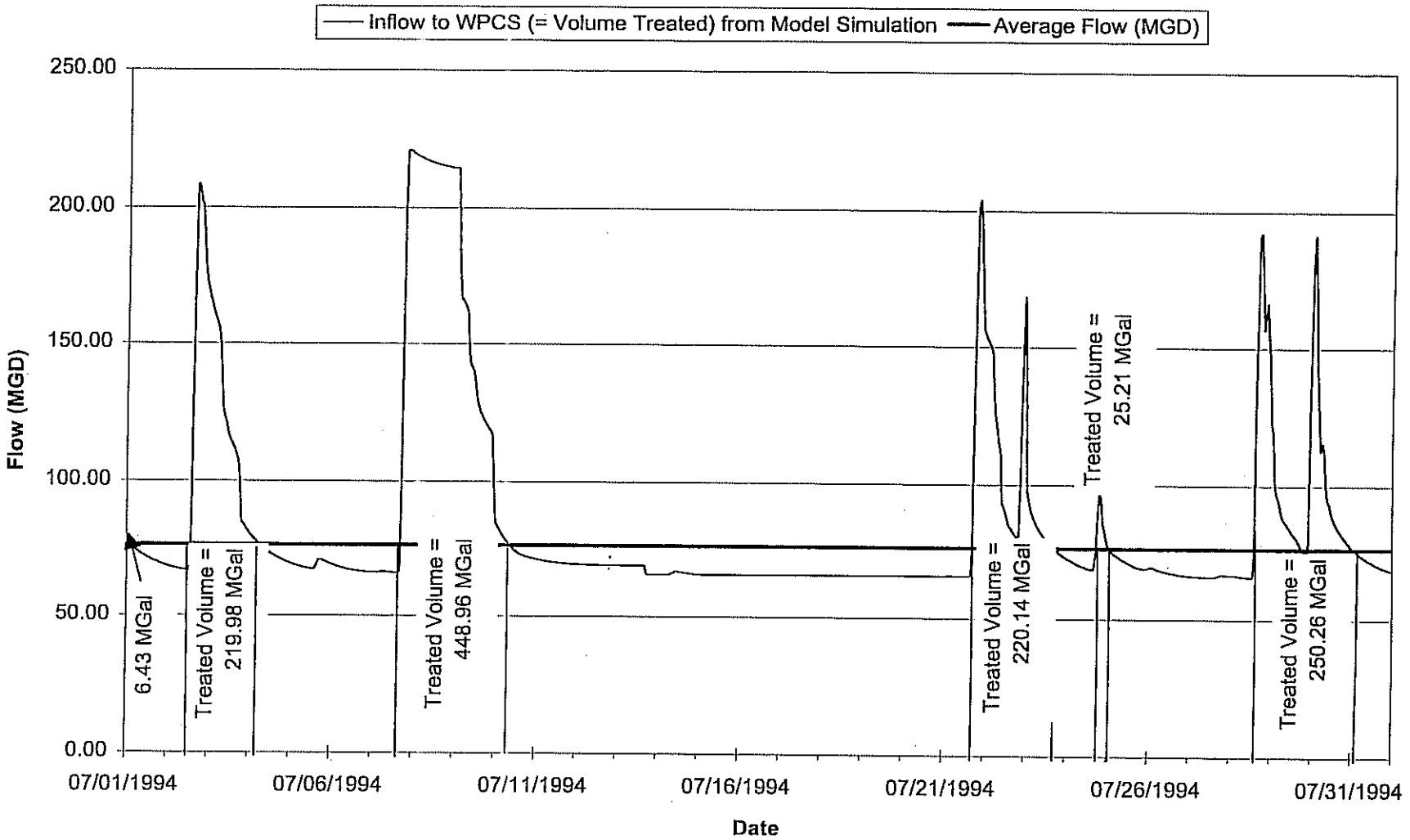


Figure 4.12 Typical Akron Precipitation Year: August
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 1317.61 MGal

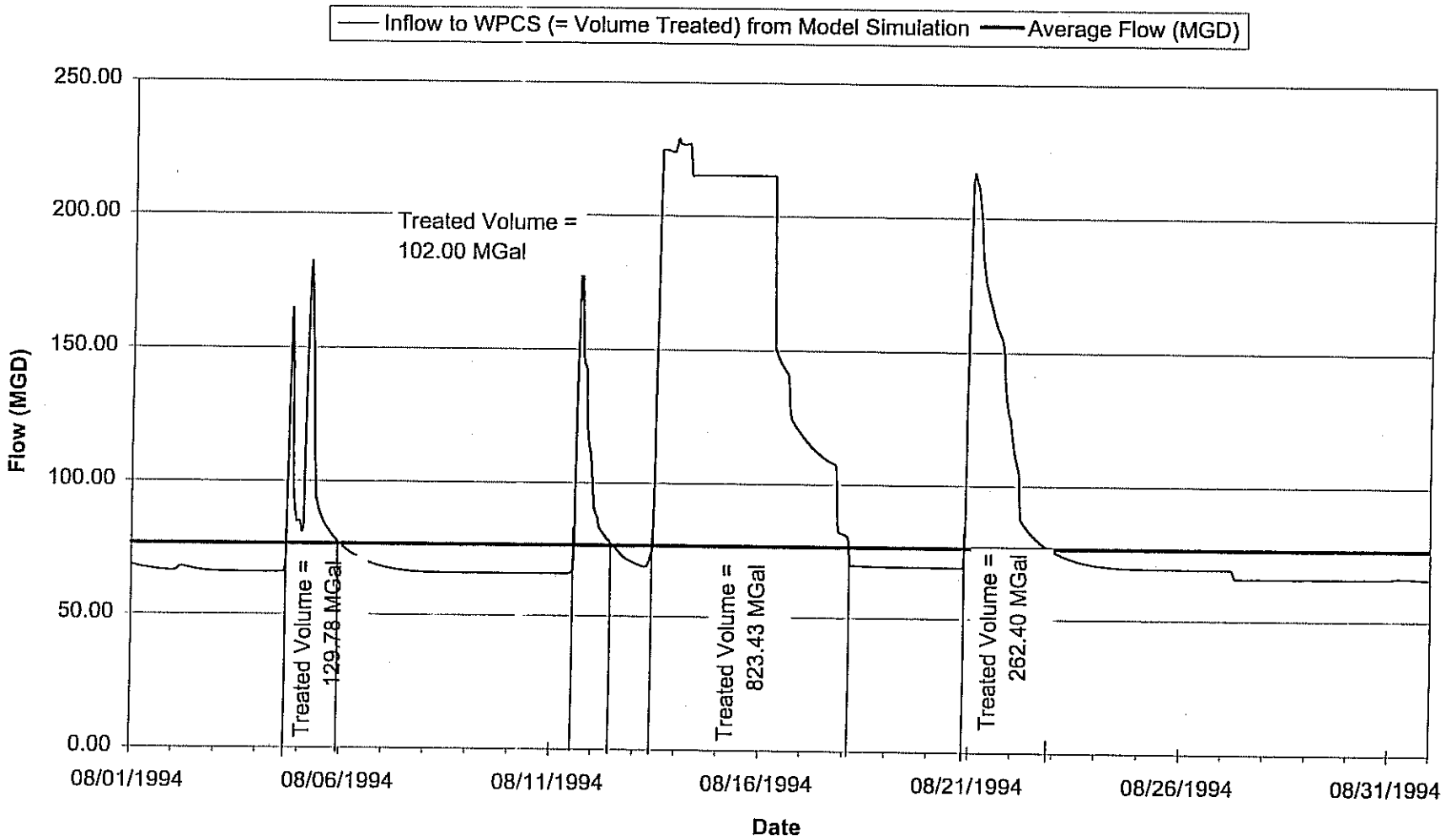


Figure 4.13 Typical Akron Precipitation Year: September
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 339.31 MGal

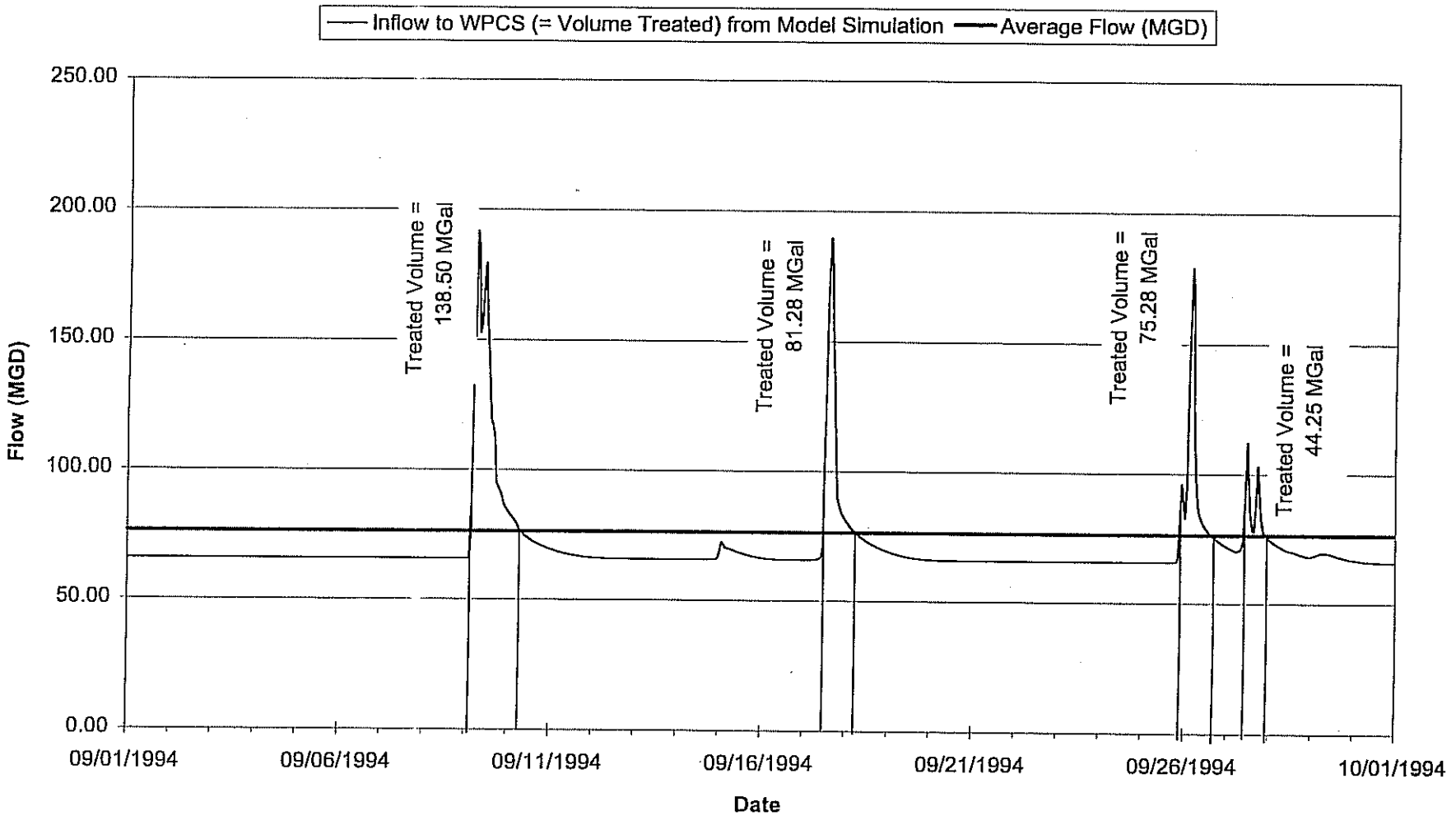


Figure 4.14 Typical Akron Precipitation Year: October
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 105.65 MGal

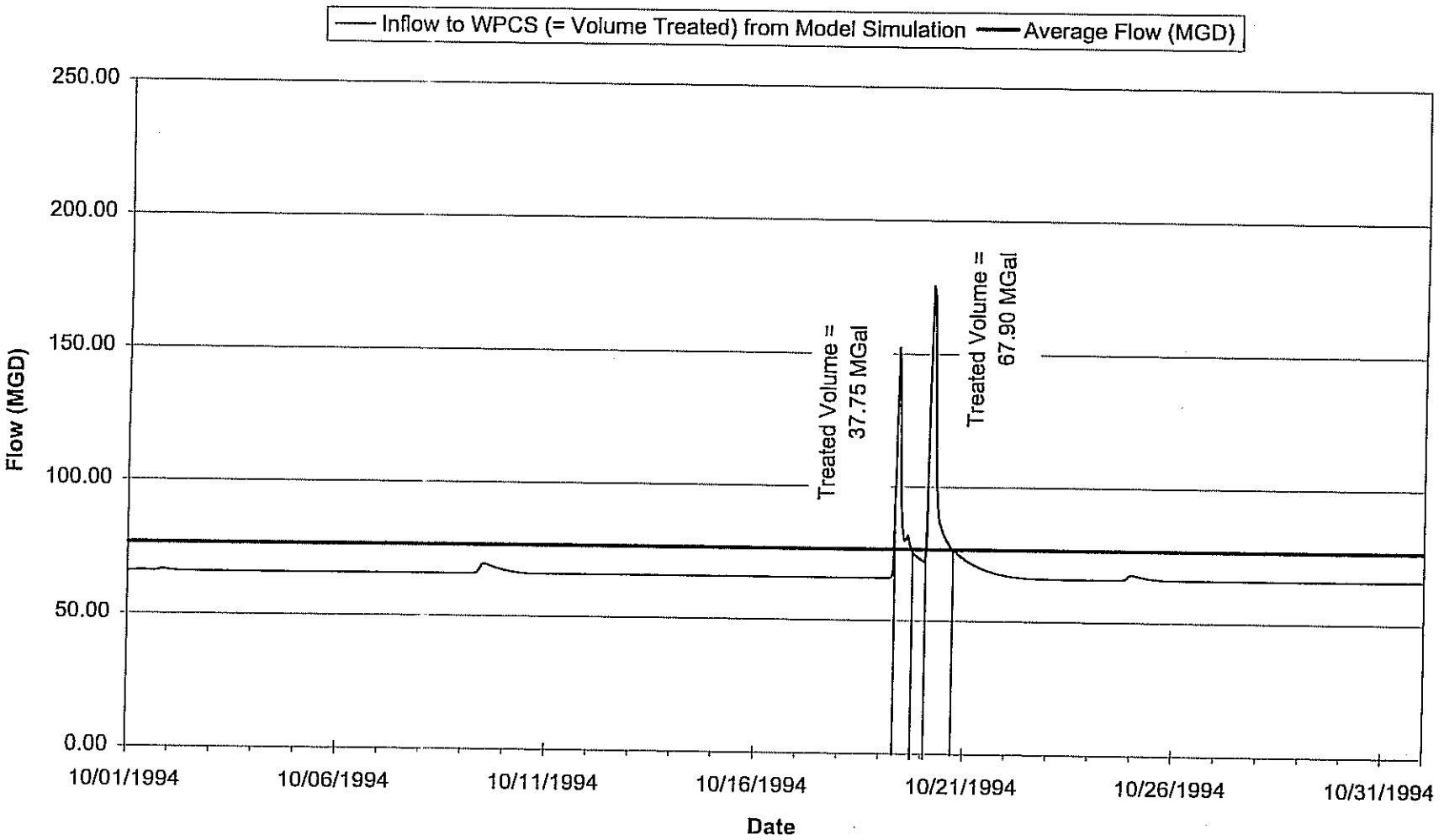


Figure 4.15 Typical Akron Precipitation Year: November
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 377.60 MGal

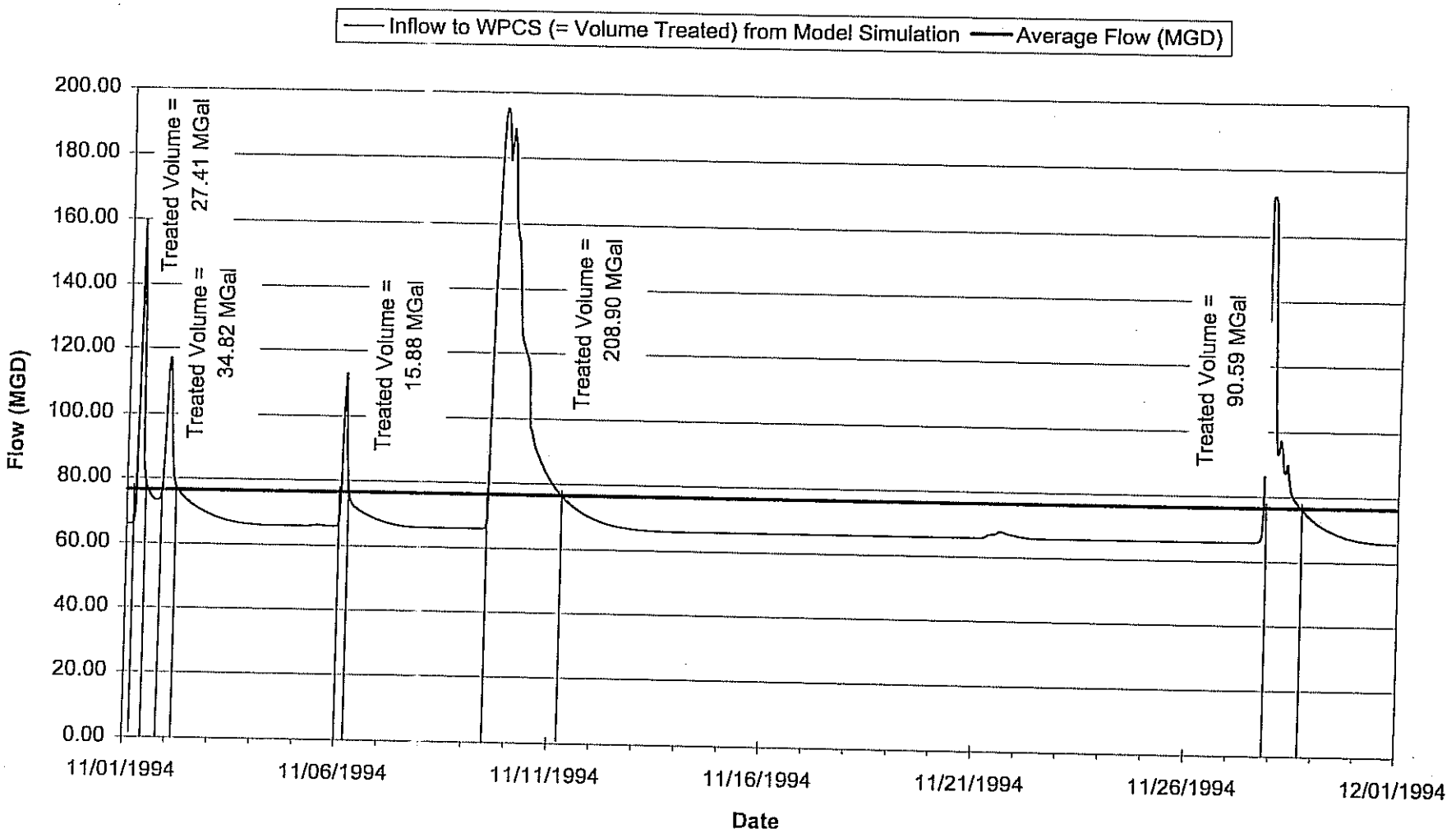
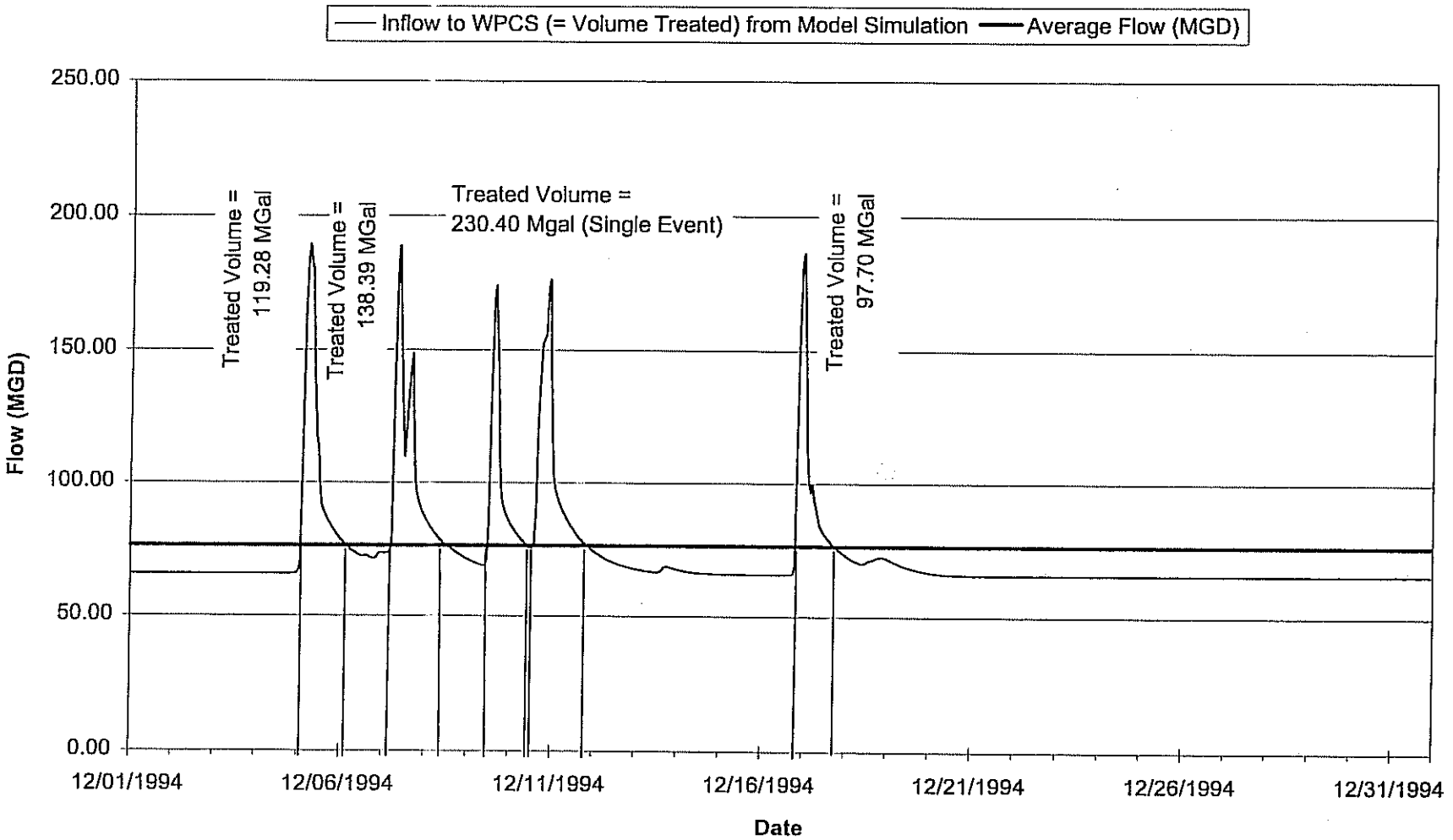


Figure 4.16 Typical Akron Precipitation Year: December
WPCS Inflows Under Integrated Alternative 2
Total Monthly Treated Volume = 585.77 MGal



5.0 IMPLEMENTATION OF LONG-TERM CONTROL PLAN '98

5.1 Implementation Plan and Schedule

The CSO Control Policy recommends a phased implementation schedule for a recommended plan. In fact, the Ohio EPA's CSO Strategy states expressly:

> "When it is necessary because of the high cost of a CSO control program, the compliance schedule can extend over several 5-year permit cycles.... Control projects that are economically achievable but not cost effective can be implemented in phases. This can allow control projects to be implemented as part of a phased TMDL (total maximum daily load) process. It also allows for periodic reassessment of subsequent projects to consider new or improved control technologies, and to consider new information that may allow the appropriate water quality standards to be achieved using more cost effective controls."

This phased implementation schedule is to be based on a financial capability assessment of the City of Akron. The assessment is to take into account the following:

- Total annual wastewater and CSO control cost per household as a percent of median household income;
- Bond ratings;
- Overall net debt as a percent of full market property values;
- Unemployment rate;
- Median household income;
- Property tax revenue collection rate; and,
- Property tax revenues as a percent of full market property value.

By implementing Ultimate Integrated Plan No. 2, the City of Akron will incur a significant burden. Specifically, the costs are projected to be approximately $250,000,000. As stated above, the Ohio EPA's CSO Strategy expressly provides that when such high costs will be incurred, "...the compliance schedule can extend over several 5-year permit cycles." As set forth in Table 5-1 and

shown in Figure 5-1, the City of Akron has developed a compliance schedule contemplating implementation over several 5-year permit cycles. The grouping of the projects in question is set forth in detail below.

The City of Akron has prioritized individual projects from the recommended Ultimate Integrated Plan No. 2, and determined the required funding levels. The projects have been grouped into initial categories which could be associated with time frames or permit cycles. The performance (reductions in overflow hours and events) of the groupings as implemented by program year is shown on Figure 5-2. The capital costs shown for each group include preliminary engineering, construction, construction inspection, construction engineering, and interest on bond anticipation notes, and are in 1998 dollars. Operation and maintenance costs are also in 1998 dollars. The debt service is computed at 5% for 20 years. The groupings are as follows:

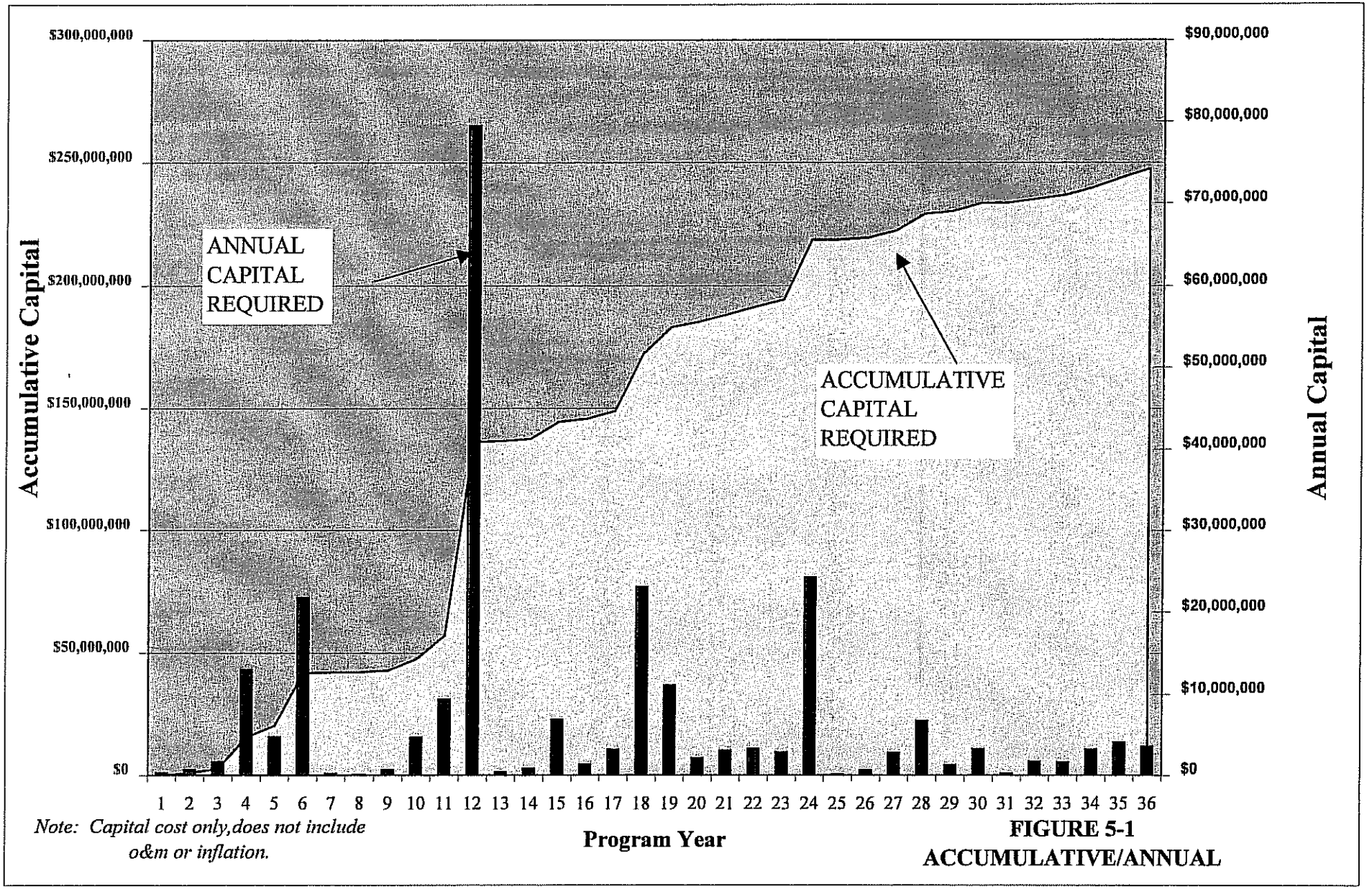
Group 1

- **Racks 40/31 Storage Basin.** Construct 502'x168'x15, 9.5 million gallon (MG) Storage Basin for Racks 40/31 near confluence of the Little Cuyahoga and Cuyahoga Rivers. This item provides the opportunity to obtain post-construction monitoring and evaluation of the effectiveness of a storage basin, addresses a CSO in a sensitive area, and addresses a large volume CSO;
- **Racks 26/28 Treatment Basin.** Construct 119'x40'x15', 0.5 MG Treatment Basin for Racks 26/28 on the Little Cuyahoga River near Hickory Street. This item provides the opportunity to obtain post-construction monitoring and evaluation of the effectiveness of a treatment basin;
- **Sewer Separation of Rack 39.** Construct 1,300' of new storm sewer within the Rack 39 drainage basin to eliminate overflows to the Ohio Canal and negate the need for expensive CSO monitoring at this rack;
- **Sewer Separation Rack 9.** Construct 950' of sewer on Kent Street to eliminate Rack 9 overflows to the Little Cuyahoga River; and

TABLE 5-1
Program Schedule

Project Grouping	Capital Cost	Accumulative Capital Cost
2000-2005		
Separation 39	$300,000	
Separation 9	$210,900	$510,900
Rack 40/31 Storage	$13,421,300	$13,932,200
Rack 26/28 Treatment	$2,561,600	$16,493,800
Separation 21/22 (partial)		
2006-2010		
WPCS Storage Phase I (20 Mgal)	$25,450,000	$41,943,800
Misc. Separations	$200,000	$42,143,800
CR Re-Aeration Pilot Study	$750,000	$42,893,800
2011-2015		
Ohio Canal Tunnel	$93,446,100	$136,339,900
LCR Restoration	$8,103,600	$144,443,500
2016-2020		
WPCS Storage Phase II (20 Mgal)	$25,450,000	$169,893,500
WPCS Disinfection	$12,600,000	$182,493,500
Rack 14 Storage	$1,984,800	$184,478,300
Rack 15 Storage	$1,651,200	$186,129,500
Rack 3 Treatment	$1,700,100	$187,829,600
Rack 12 Treatment	$2,201,400	$190,031,000
2021-2025		
Northside Tunnel	$28,371,900	$218,402,900
2026-2030		
Rack 8 Separation	$2,326,400	$220,729,300
Rack 30 Separation	$7,574,000	$228,303,300
Rack 36 Storage	$992,800	$229,296,100
Rack 10/11 Treatment	$3,723,600	$233,019,700
2031-2035		
Rack 5/7 Storage	$1,672,800	$234,692,500
Rack 22 Storage	$1,283,000	$235,975,500
Rack 25 Separation	$2,974,500	$238,950,000
Rack 13 Separation	$4,328,200	$243,278,200
Rack 21 Separation	$2,199,500	$245,477,700
Rack 29/27 Treatment	$1,934,100	$247,411,800
Total Capital Cost	**$247,411,800**	

What revenue source will be pursued for major projects



Note: Capital cost only,does not include o&m or inflation.

FIGURE 5-1
ACCUMULATIVE/ANNUAL

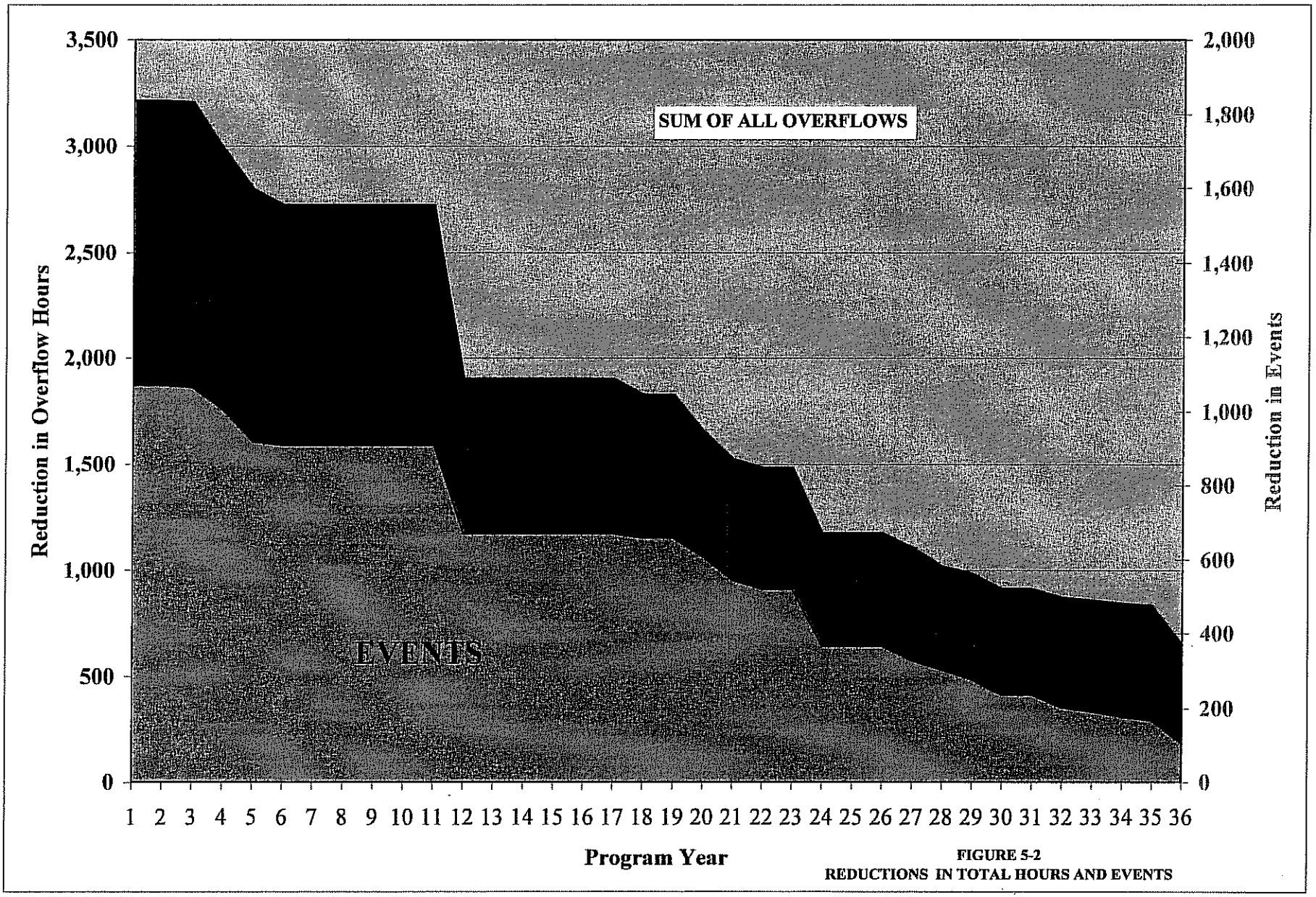


FIGURE 5-2
REDUCTIONS IN TOTAL HOURS AND EVENTS

- **Partial Sewer Separation of Racks 21/22.** Construct 1,000' of new storm sewer along North Howard Street (in conjunction with a planned bridge reconstruction project) to minimize overflows from Racks 21/22 to the Little Cuyahoga River.

Capital Cost	**- $16,704,700**
Annual Operation and Maintenance Cost	**- 303,900**
Debt Service	**- 1,340,400**

Group 2

- **WPCS Storage Phase I.** Construct 20 MG Retention Basin at the WPCS to store storm flow. The retention basin will be constructed prior to the increased capture and transport resulting from the construction of the OCI Tunnel, so as not to increase the WPCS secondary bypass;
- **Miscellaneous Separations.** Identify, design, and construct separation projects to minimize overflows; and
- **Cuyahoga River Re-Aeration Pilot Study.** Implement pilot study along the Cuyahoga River to evaluate the benefits of stream re-aeration structures to improve water quality.

Capital Cost	**- $26,410,900**
Annual Operation and Maintenance Cost	**- 247,000**
Debt Service	**- 2,119,300**

Group 3

- **Ohio Canal Tunnel .** Construct 23' diameter with a 48" diameter inner pipe, 5,500' long, 15 MG Deep Tunnel to store overflows from Racks 4, 16, 17/Diversion Chamber, 18, 19, 20, 23, 24, 37, and a portion of Rack 21 now discharging to the Ohio Canal; and

- **Little Cuyahoga River Restoration.** Improve water quality by modifying bank protection, planting vegetation, and rebuilding the stream to a more natural state.

Capital Cost	**- $101,549,700**
Annual Operation and Maintenance Cost	**- 343,000**
Debt Service	**- 8,148,600**

Group 4

- **WPCS Storage Phase II.** Construct 20 MG Retention Basin at the WPCS to store storm flow. The retention basin will be constructed prior to the increased capture and transport resulting from the construction of additional storage and treatment basins, and the NSI Tunnel, so as not to increase the WPCS secondary bypass;
- **WPCS Disinfection.** Construct disinfection improvements at WPCS;
- **Rack 14 Storage.** Construct 185'x61'x15', 1.3 MG Storage Basin for Rack 14 on the Little Cuyahoga River near North Forge Street;
- **Rack 15 Storage.** Construct 134'x45'x15', 0.7 MG Storage Basin for Rack 15 on the Little Cuyahoga River near East North Street;
- **Rack 3 Treatment.** Construct 81'x27'x15', 0.25 MG Treatment Basin for Rack 3 on the Little Cuyahoga River near Kelly Avenue; and
- **Rack 12 Treatment.** Construct 146'x49'x15', 0.8 MG Treatment Basin for Rack 12 on Camp Brook near Evans Avenue.

Capital Cost	**- $45,587,500**
Annual Operation and Maintenance Cost	**- 600,000**
Debt Service	**- 3,658,100**

Group 5

- **Northside Tunnel.** Construct an 8' diameter with a 42" diameter inner pipe, 8,700' long, 2.5 MG Tunnel to store overflows from Racks 32, 33, 34, and 35 now discharging to the Cuyahoga River.

Capital Cost	**- $28,371,900**
Annual Operation and Maintenance Cost	**- 172,000**
Debt Service	**- 2,276,600**

Group 6

- **Sewer Separation Rack 8.** Construct 3,350' of new sewer within the Rack 8 drainage basin to eliminate overflows;
- **Sewer Separation Rack 30.** Construct 7,300' of new sewer within the Rack 30 drainage basin to eliminate overflows;
- **Rack 36 Storage Basin.** Construct 80'x27'x15', 0.2 MG Storage Basin for Rack 36 on the Cuyahoga River near Valley View Golf Course; and
- **Racks 10/11 Treatment Basin.** Construct 86'x29'x15', 0.3 MG Treatment Basin for Racks 10/11 on the Little Cuyahoga River near Hazel Street.

Capital Cost	**- $14,616,800**
Annual Operation and Maintenance Cost	**- 111,800**
Debt Service	**- 1,169,900**

Group 7

- **Racks 5/7 Storage.** Construct 64'x22'x15', 0.15 MG Storage Basin for Racks 5/7 on the Little Cuyahoga River near the intersection of South Case Avenue and River Street;

- **Rack 22 Storage.** Construct 97'x33'x15', 0.35 MG Storage Basin for Rack 22 on the Little Cuyahoga River near the intersection of Cuyahoga Street and Lods Street;
- **Sewer Separation of Rack 25.** Construct 4,870' of new sewer within the Rack 25 drainage basin to eliminate overflows to the Little Cuyahoga River;
- **Sewer Separation of Rack 13.** Construct 5,800' of new sewer within the Rack 13 drainage basin to eliminate overflows to the Little Cuyahoga River;
- **Sewer Separation of Remaining Portion of Rack 21.** Construct 9,600' of new sewer within the Rack 21 drainage basin to eliminate overflows to the Little Cuyahoga River (Note: A portion of Rack 21 was diverted the Ohio Canal Interceptor Tunnel); and
- **Racks 27/29 Treatment Basin.** Construct 50'x18'x15', 0.1 MG Treatment Basin for Racks 27/29 on the Little Cuyahoga River near Memorial Parkway.

Capital Cost	**- $14,392,100**
Annual Operation and Maintenance Cost	**- 178,000**
Debt Service	**- 1,154,900**

After each group of projects is completed, a post-construction monitoring program, which is discussed in Section 5.3, will be conducted to determine the effectiveness of the improvements. Each type of improvement will be assessed to determine if modifications are needed in order to improve their operation and effectiveness. At the same time, the City of Akron's financial capabilities will be assessed to determine its ability to afford the next group of scheduled projects. Modifications to the implementation schedule for the projects referenced in this Long-Term Control Plan may be required, depending on the results of these periodic financial assessments. These modifications will then be incorporated into the next set of projects. Based on the results of the post-construction monitoring program and periodic financial assessments, projects could be re-prioritized and the approach (treatment basin, storage basin, etc.) altered.

As part of developing this long-term control plan. Akron evaluated several options to fund the projects set forth in Table 5-1. Given the significant total cost of these projects, it is likely that funds will have to be obtained from multiple sources, i.e. grants, low interest loans and revenues

obtained from Akron's sewer rates. While the completion of the projects identified in Table 5-1 is contingent upon the availability of financing, the City of Akron will make the required level of financial commitment required under the Ohio and Federal CSO Policies. Specifically, Akron will "aggressively pursue financial arrangements" for the implementation of the projects identified within Table 5-1. It is important to note that Akron has demonstrated a similar commitment in the past. Specifically, Akron obtained funds in the amount of approximately $25 million dollars to eliminate SSOs within the sewer system. Moreover, to date, Akron has spent millions to study, address and reduce CSOs within its system.

5.2 Impacts on the Existing Operational Plan

Operation and maintenance plans will be developed for the improvements as they are implemented. These operation and maintenance plans will be incorporated into the existing operation and maintenance program for the combined sewer system. The first grouping includes treatment and storage basins. These initial storage and treatment basins will serve as pilot facilities for the design and development of future storage and treatment facilities that are in future groupings. Operation and maintenance of these facilities will be refined through monitoring and experience, and will be incorporated into the existing operation and maintenance program of the combined sewer system.

5.3 Post-Construction Compliance Monitoring Program

The City of Akron has constructed monitoring stations at key points along the receiving streams to monitor the effects of the CSOs on the receiving streams. These stations in conjunction with the rainfall gauge network and the Motorola "Moscad" monitoring system in the CSOs will provide pre- and post-construction information on the receiving waters. The monitoring stations could also be supplemented with temporary sampling and flow monitoring if it is deemed necessary. In addition, the previous studies conducted by the City of Akron have collected an enormous amount of data on the chemical, biological, and bacterial composition of the receiving streams and flow data on CSOs and receiving waters for both dry and wet weather events. This data also presents additional information on the baseline conditions prior to the construction of any improvements.

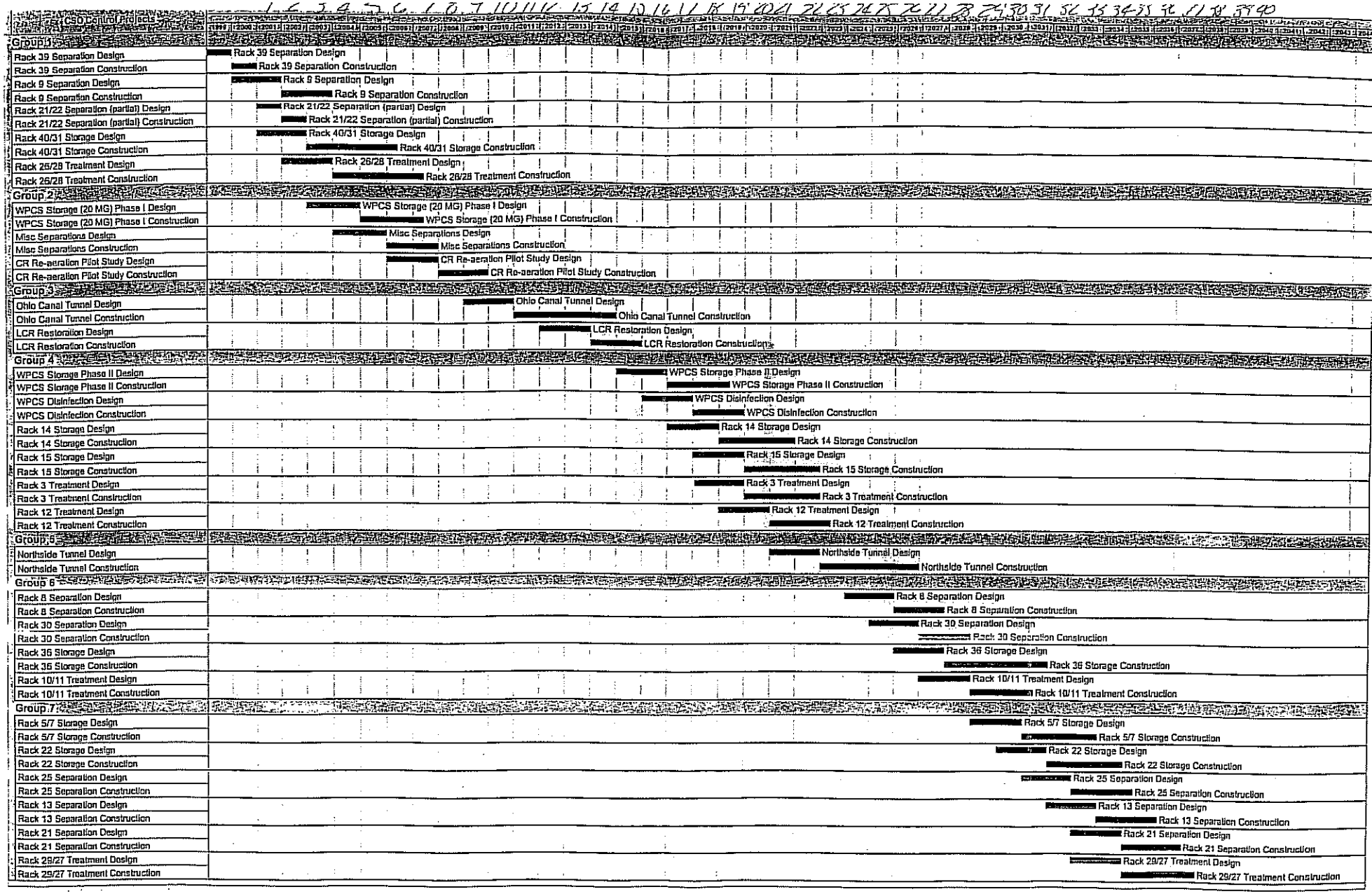


FIGURE 5-3
PROPOSED IMPLEMENTATION SCHEDULE

5.4 2002 Long Term Control Plan (LTCP), Additional Evaluation

The City of Akron believes that its LTCP meets the requirements of the presumptive approach as demonstrated in Chapter 4 of this report. However, the Ohio EPA requested that the City of Akron conduct additional evaluations. These evaluations included (1) a further evaluation of express sewers for the major separate sewer areas upstream of combined sewer areas, (2) evaluate additional treatment at the proposed CSO facility for the Ohio Canal Tunnel, CSO Rack 40, Northside Tunnel and WPCS Secondary By-pass and (3) evaluate the proposed schedule based on the staging requirements of the various projects, constructability, water quality improvements and City of Akron sewer user rate financial analysis.

Express Sewers

The express sewer alternative had been evaluated and eliminated for further evaluation in the original long term control plan because the screening level evaluation suggested that negligible benefit would be received at a considerable expense. The express sewer alternative was re-evaluated at the request of Ohio EPA to consider intercepting upstream flow from separate sanitary sewer drainage areas from combined sewer drainage areas 11 and 12, 18, 35 and Main and Babb master meters. CSO Rack 40 was also included in the evaluation.

All express sewers considered in this evaluation were modeled and sized for a 5-year design storm and tunnels were modeled and sized for a 6-month design storm. The estimated planning cost for this alternative is $489 million (2002 capital).

Moreover, Express sewers were shown by the model to increase secondary bypass at the Akron WPCS. Water quality model results indicate that express sewers would increase the CBOD load in Akron's system by almost 1% more that the recommended Integrated Alternative 2 at a cost of 2.5 times greater than Alternative 2.

The express sewer tunnel alternative was also evaluated for a 10-year storm. The estimated planning cost for this alternative is $579 million (2002 capital).

The Express Sewer alternative is not warranted due to lack of water quality benefit at an excessive cost. The detailed evaluation can be found in the Long Term Control Plan - Additional Evaluations dated May 2002 (referred herein as "Technical Report").

Enhanced High Rate Clarification (EHRC)

Based on the discussions and recommendations of the Ohio EPA, the City evaluated EHRC technology at CSO Rack 40 and the overflows to the proposed tunnels within Alternative 2. Given the close proximity of the proposed CSO Rack 40 basin to the proposed NSI Tunnel overflow, combining these facilities in two phases was appropriate for evaluation purposes.

The evaluation of these two alternatives was based on a size sufficient to capture and treat all storms from the average model year used to develop the Facilities Plan evaluation. These alternatives were incorporated into the existing hydraulic model with all proposed Alternative 2 improvements to measure the additional amount of CBOD capture.

The estimated planning cost of the EHRC to CSO Rack 40/NS Tunnel is $12 million (2002 capital) for Phase 2 and $13 million (2002 capital) for Phase 3. The estimated planning cost of the EHRC to the OCI is $52 million (2002 capital).

EHRC (or some other type of additional treatment) were shown in the model to provide increased removal of CBOD without increasing secondary by-pass at the WPCS. It may be shown during post construction monitoring that additional treatment is warranted. Due to the potential benefit, the City will add treatability/pilot phases to the LTCP and incorporate the possibility of additional treatment phases into the schedule.

The detailed evaluation can be found in the Technical Report.

Additional Treatment at WPCS

The treatment provided during wet weather at the WPCS includes primary treatment of wet weather flow and blending with secondary treated effluent. At the request of Ohio EPA, EHRC was evaluated as a means of providing additional CBOD removal from the blended effluent. The addition of parallel wet weather treatment system was evaluated using EHRC.

The estimated planning cost of the EHRC at the WPCS is $11 million (2002 capital) for Phase 1a and $11 million (2002 capital) for Phase 2a.

EHRC (or some other type of additional treatment) were shown in the model to provide increased removal of CBOD. It may be shown during post construction monitoring that additional treatment is warranted. Due to the potential benefit, the City will add treatability/pilot phases to the LTCP and incorporate the possibility of additional treatment phases into the schedule.

The detailed evaluation can be found in the Technical Report.

Implementation Plan and Schedule

As stated in Section 5.1, after each group of projects is completed a post construction monitoring program will be performed to determine the effectiveness of the improvements. Each type of improvement will be addressed to determine if modifications are needed in order to improve their operation and effectiveness. These opportunities will be enhanced with the additions of treatability/pilot and specific post construction monitoring as shown on Table 5-2 and discussed in the preceding sections. Based on an evaluation of the actual CSO quantity and quality, additional phases may be added to the

Stetler

LTCP. This evaluation will be based on a benefit-effective reduction of pollutants based on receiving stream water quality concerns and Section 5.1, Implementation Plan and Schedule.

The treatability/pilot projects will examine treatment technologies, including but not limited to, EHRC. The EHRC technology appears to have a high operation and maintenance cost especially for a potentially remote site. This technology also has very limited actual operation and experience in the States. A majority of the EHRC installations are on potable water supply and storm water applications in Europe. Also, the type and size of an additional treatment unit can not be determined until post construction monitoring is completed on the tunnel/storage component Alternative 2.

Assuming the implementation of the projects shown on Table 5-2 two user rate spreadsheets were developed. They are attached as Figures 5-4 and 5-5. Figure 5-4 shows projected user rate increases on an annual basis as needed until adequate funds are generated to support the program. Figure 5-5 shows rates increases in 5 year periods. These rate increases will be impacted by receipt of grants, low interest loans, changes in the negotiated sewer contracts with outside communities and the periodic evaluations set forth in Section 5.1. These user rate scenarios are submitted to demonstrate the need for at least a 30-year schedule. The actual increases will be determined based on the annual and five year needs in the capital budget.

The proposed schedule shows a reduction in the overall schedule to 30 years from the originally proposed 36 years.

5/28/02

TABLE 5-2
Program Schedule - 30 Year Program

Attorney/Client Privileged Document
Attorney Work Product

	Capital Cost 1998	Capital Cost 2002	Capital Cost 2003
2003-2007			
Rack 39 Separation	$300,000		$331,224
Rack 9 Separation	$210,900		$232,851
TREATABILITY/PILOTS		$500,000	$510,000
Rack 40/31 Storage Basin Phase 1	$13,421,300		$14,818,200
POST CONSTR MONITORING		$100,000	$102,000
Rack 26/28 Treatment Basin	$2,561,600		$2,828,213
Separation 21/22 (partial)			
2008-2012			
WPCS Storage Phase 1 (20 MG)	$25,450,000		$28,098,856
WPCS PHASE 1a		$11,230,000	$11,454,600
TREATABILITY/PILOT / POST CONST		$100,000	$102,000
Misc Separations	$200,000		$220,816
CR Re-Aeration Structures	$750,000		$828,061
RACK 40/31 PHASE 2		$12,230,000	$12,474,600
2013-2017			
Ohio Canal Tunnel Phase 1	$93,446,100		$103,172,045
POST CONSTR MONITORING		$100,000	$102,000
LCR Stream Restoration	$8,103,600		$8,947,029
2018-2022			
OCI PHASE 2		$52,391,200	$53,439,024
WPCS Storage Phase 2 (20 MG)	$25,450,000		$28,098,856
WPCS PHASE 2a		$11,230,000	$11,454,600
WPCS Disinfection	$12,600,000		$13,911,418
Rack 14 Storage Basin	$1,984,800		$2,191,380
Rack 15 Storage Basin	$1,651,200		$1,823,058
Rack 3 Treatment Basin	$1,700,100		$1,877,048
Rack 12 Treatment Basin	$2,201,400		$2,430,523
2023-2027			
North Side Tunnel	$28,371,900		$31,324,870
POST CONSTR MONITORING		$100,000	$102,000
Rack 8 Separation	$2,326,400		$2,568,534
Rack 30 Separation	$7,574,000		$8,362,308
Rack 36 Storage Basin	$992,800		$1,096,131
Rack 10/11 Treatment Basin	$3,723,600		$4,111,155
RACK 40/31-NS Tunnel PHASE 3		$13,468,972	$13,738,351
2028-2033			
Rack 7/5 Storage Basin	$1,672,800		$1,846,906
Rack 22 Storage Basin	$1,283,000		$1,416,536
Rack 25 Separation	$2,974,500		$3,284,088
Rack 13 Separation	$4,328,200		$4,778,683
Rack 21 Separation	$2,199,500		$2,428,426
Rack 29/27 Treatment Basin	$1,934,100		$2,135,403
subtotal	**$247,411,800**	**$101,450,172**	**$376,641,794**
Annual Capital Expenditures			
Inflow Elimination	$400,000		$400,000
Nine Minimum Controls	$100,000		$100,000
Miscellaneous Separations	$200,000		$200,000
Total Capital Cost	**$248,111,800** (1998$)	**$101,450,172** (2002$)	**$377,341,794** (2003$)

CITY OF AKRON LTCP - 30 YEAR IMPLEMENTATION SCHEDULE WITH ADDITIONAL TREATMENT (5 YEAR INCREASES) FIGURE 5-5

1 2 3 4 5 6

LINE	ITEM	CAPITAL COST	DEBT SERVICE	ANNUAL O&M COST	2003	2004	2005	2006	2007	2008	2009	2010
1	Beginning Balance				$ -	$ 3,193,552	$ 6,642,524	$ 9,984,169	$ 11,469,779	$ 12,709,443	$ 19,041,240	$ 22,231,749
2												
3	Projected 2002 Operation & Maintenance & Replacement			$ 33,800,000	$ 34,138,000	$ 34,479,380	$ 34,824,174	$ 35,172,416	$ 35,524,140	$ 35,879,381	$ 36,238,175	$ 36,600,557
4	Rack 39 Separation	$ 300,000	$ -	$ 1,900	$ 333,221	$ 2,017	$ 2,037	$ 2,057	$ 2,078	$ 2,099	$ 2,120	$ 2,141
5	Rack 9 Separation	$ 210,900	$ -	$ 2,000	Construction	$ 239,631	$ 2,144	$ 2,166	$ 2,187	$ 2,209	$ 2,231	$ 2,254
6	Treatability/Pilot	$ 457,600	$ -	$ -	$ 505,227	Treat./Pilot						
7	Rack 40/31 Storage Basin Phase 1	$ 13,421,300	$ 1,076,960	$ 128,100	Preliminary	Design/Const.	Construction	$ 1,400,544	$ 1,401,931	$ 1,403,332	$ 1,404,747	$ 1,406,176
8	Post Construction Monitoring	$ 91,500	$ -	$ -				$ 107,207	Post Con. Mon.	Post Con. Mon.		
9	Rack 26/28 Treatment Basin	$ 2,561,600	$ 205,549	$ 118,700			Preliminary	Design	Construction	$ 381,682	$ 382,993	$ 384,318
10	Separation 21/22 (partial)											
11	WPCS Storage Phase 1 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600				Preliminary	Design	Construction	$ 2,779,725	$ 2,782,130
12	WPCS Phase 1a	$ 10,277,100	$ 824,661	$ 88,000						Preliminary	Design	Construction
13	Treatability/Pilot/Post Construction Monitoring	$ 91,500	$ -	$ -								
14	CR Re-Aeration Structures	$ 750,000	$ -	$ 10,000						Preliminary	Design	Construction
15	Rack 40/31 Storage Basin Phase 2	$ 11,192,300	$ 898,099	$ 103,800							Preliminary	Design
16	Ohio Canal Tunnel Phase 1	$ 93,446,100	$ 7,498,357	$ 806,300								
17	Post Construction Monitoring	$ 91,500	$ -	$ -								
18	LCR Stream Restoration	$ 8,103,600	$ 650,254	$ 50,000								
19	OCI Phase 2	$ 47,945,500	$ 3,847,271	$ 274,100								
20	WPCS Storage Phase 2 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600								
21	WPCS Storage Phase 2a	$ 10,277,100	$ 824,661	$ 88,000								
22	WPCS Disinfection	$ 12,600,000	$ 1,011,057	$ 55,300								
23	Rack 14 Storage Basin	$ 1,984,800	$ 159,265	$ 34,600								
24	Rack 15 Storage Basin	$ 1,651,200	$ 132,497	$ 28,600								
25	Rack 3 Treatment Basin	$ 1,700,100	$ 136,420	$ 78,600								
26	Rack 12 Treatment Basin	$ 2,201,400	$ 176,646	$ 170,000								
27	North Side Tunnel	$ 28,371,900	$ 2,276,635	$ 172,000								
28	Post Construction Monitoring	$ 91,500	$ -	$ -								
29	Rack 8 Separation	$ 2,326,400	$ 186,676	$ 4,600								
30	Rack 30 Separation	$ 7,574,000	$ 607,757	$ 6,900								
31	Rack 36 Storage Basin	$ 992,800	$ 79,665	$ 20,000								
32	Rack 10/11 Treatment Basin	$ 3,723,600	$ 288,791	$ 80,300								
33	Rack 40/31-NS Tunnel Phase 3	$ 12,326,100	$ 989,076	$ 117,700								
34	Rack 7/5 Storage Basin	$ 1,672,800	$ 134,230	$ 18,900								
35	Rack 22 Storage Basin	$ 1,283,000	$ 102,951	$ 29,200								
36	Rack 25 Separation	$ 2,974,500	$ 238,682	$ 8,300								
37	Rack 13 Separation	$ 4,326,200	$ 347,306	$ 7,200								
38	Rack 21 Separation	$ 2,199,500	$ 176,494	$ 10,400								
39	Rack 29/27 Treatment Basin	$ 1,934,100	$ 155,197	$ 104,000								
40	Inflow Elimination				$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
41	Nine Minimum Controls				$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
42	Miscellaneous Separations	$ 200,000			$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
43												
44	Totals	$ 340,253,500	$ 27,119,507	$ 36,846,600	$ 35,676,449	$ 35,421,028	$ 35,528,355	$ 37,384,390	$ 37,830,336	$ 38,368,704	$ 41,509,991	$ 41,877,575
45												
46	Projected 2002 Revenue			$ 33,000,000								
47	Projected Revenue [Existing Revenue x % Rate Increase]				$ 38,670,000	$ 38,670,000	$ 38,670,000	$ 38,670,000	$ 38,670,000	$ 44,700,500	$ 44,700,500	$ 44,700,500
	% Rate Increase Needed				15.0%	0.0%	0.0%	0.0%	0.0%	15.0%	0.0%	0.0%
48												
49	Subtotals			$ 33,800,000	$ 38,670,000	$ 38,670,000	$ 38,670,000	$ 38,670,000	$ 38,670,000	$ 44,700,500	$ 44,700,500	$ 44,700,500
50												
51	Totals					$ 38,670,000	$ 38,670,000	$ 38,670,000	$ 38,670,000	$ 44,700,500	$ 44,700,500	$ 44,700,500
52												
53	Ending Balance				$ 3,193,552	$ 6,642,524	$ 9,984,169	$ 11,469,779	$ 12,709,443	$ 19,041,240	$ 22,231,749	$ 25,054,673
54												
55	Monthly Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)			27.94	$ 32.13	$ 32.13	$ 32.13	$ 32.13	$ 32.13	$ 36.95	$ 36.95	$ 36.95
56	Annual Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)				$ 385.57	$ 385.56	$ 385.56	$ 385.56	$ 385.56	$ 443.40	$ 443.40	$ 443.40

Notes
1. Capital Costs include preliminary engineering, design engineering, construction, construction inspection, construction engineering, and interest on bond anticipation notes.
2. Capital Costs are in 1998 dollars and are inflated at a rate of 2% per year to the year during which construction begins.
3. O&M Costs are in 1998 dollars and are inflated at a rate of 1% per year.
4. Debt Service is computed at 5% for 20 years.

Status

CITY OF AKRON LTCP - 30 YEAR IMPLEMENTATION SCHEDULE WITH ADDITIONAL TREATMENT (5 YEAR INCREASES) FIGURE 5-5

7 8 9 10 11 12 13 14

LINE	ITEM	CAPITAL COST	DEBT SERVICE	ANNUAL O&M COST	2011	2012	2013	2014	2015	2016	2017	2018
1	Beginning Balance				$ 25,054,673	$ 25,886,251	$ 25,155,766	$ 32,984,343	$ 40,428,066	$ 34,930,823	$ 29,158,974	$ 22,980,368
2												
3	Projected 2002 Operation & Maintenance & Replacement			$ 33,000,000	$ 36,966,562	$ 37,336,228	$ 37,709,590	$ 38,086,686	$ 38,467,553	$ 38,852,228	$ 39,240,751	$ 39,633,159
4	Rack 39 Separation	$ 300,000	$ -	$ 1,900	$ 2,162	$ 2,184	$ 2,206	$ 2,229	$ 2,250	$ 2,273	$ 2,295	$ 2,316
5	Rack 9 Separation	$ 210,900	$ -	$ 2,000	$ 2,276	$ 2,299	$ 2,322	$ 2,345	$ 2,369	$ 2,392	$ 2,416	$ 2,440
6	Treatability/Pilot	$ 457,600	$ -	$ -								
7	Rack 40/31 Storage Basin Phase 1	$ 13,421,300	$ 1,076,960	$ 128,100	$ 1,407,620	$ 1,409,078	$ 1,410,550	$ 1,412,037	$ 1,413,539	$ 1,415,057	$ 1,416,589	$ 1,418,136
8	Post Construction Monitoring	$ 91,500	$ -	$ -								
9	Rack 26/28 Treatment Basin	$ 2,561,600	$ 205,549	$ 118,700	$ 385,655	$ 387,006	$ 388,371	$ 389,749	$ 391,141	$ 392,546	$ 393,966	$ 395,400
10	Separation 21/22 (partial)											
11	WPCS Storage Phase 1 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600	$ 2,784,559	$ 2,787,013	$ 2,789,491	$ 2,791,994	$ 2,794,523	$ 2,797,076	$ 2,799,655	$ 2,802,259
12	WPCS Phase 1a	$ 10,277,100	$ 824,661	$ 88,000	$ 1,166,939	$ 1,167,941	$ 1,168,952	$ 1,169,974	$ 1,171,006	$ 1,172,048	$ 1,173,101	$ 1,174,164
13	Treatability/Pilot/Post Construction Monitoring	$ 91,500	$ -	$ -	$ 118,365	Post Con. Mon.	Post Con. Mon.					
14	CR Re-Aeration Structures	$ 750,000	$ -	$ 10,000	$ 334,783	$ 334,866	$ 335,011	$ 335,127	$ 335,245	$ 335,363	$ 335,483	$ 335,604
15	Rack 40/31 Storage Basin Phase 2	$ 11,182,300	$ 898,099	$ 103,800	Construction	$ 1,304,338	$ 1,305,531	$ 1,306,736	$ 1,307,954	$ 1,309,183	$ 1,310,424	$ 1,311,678
16	Ohio Canal Tunnel Phase 1	$ 93,446,100	$ 7,498,357	$ 806,300	Preliminary	Design	Construction	Construction	$ 11,454,414	$ 11,463,964	$ 11,473,608	$ 11,483,349
17	Post Construction Monitoring	$ 91,500	$ -	$ -					$ 128,122	Post Con. Mon.	Post Con. Mon.	
18	LCR Stream Restoration	$ 8,103,600	$ 650,254	$ 50,000		Preliminary	Design	Construction	$ 969,728	$ 970,320	$ 970,918	$ 971,522
19	OCI Phase 2	$ 47,945,500	$ 3,847,271	$ 274,100							Preliminary	Design
20	WPCS Storage Phase 2 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600						Preliminary	Design	Construction
21	WPCS Storage Phase 2a	$ 10,277,100	$ 824,661	$ 88,000								
22	WPCS Disinfection	$ 12,600,000	$ 1,011,057	$ 55,300							Preliminary	Design
23	Rack 14 Storage Basin	$ 1,984,600	$ 159,265	$ 34,500								Preliminary
24	Rack 15 Storage Basin	$ 1,651,200	$ 132,497	$ 28,600								
25	Rack 3 Treatment Basin	$ 1,700,100	$ 136,420	$ 76,600								
26	Rack 12 Treatment Basin	$ 2,201,400	$ 176,646	$ 170,000								
27	North Side Tunnel	$ 28,371,900	$ 2,276,635	$ 172,000								
28	Post Construction Monitoring	$ 91,500	$ -	$ -								
29	Rack 8 Separation	$ 2,326,400	$ 186,676	$ 4,600								
30	Rack 30 Separation	$ 7,574,000	$ 607,757	$ 6,900								
31	Rack 36 Storage Basin	$ 992,800	$ 79,665	$ 20,000								
32	Rack 10/11 Treatment Basin	$ 3,723,600	$ 298,791	$ 80,300								
33	Rack 40/31-NS Tunnel Phase 3	$ 12,328,100	$ 989,078	$ 117,700								
34	Rack 7/5 Storage Basin	$ 1,672,800	$ 134,230	$ 18,900								
35	Rack 22 Storage Basin	$ 1,283,000	$ 102,951	$ 29,200								
36	Rack 25 Separation	$ 2,974,500	$ 238,682	$ 8,300								
37	Rack 13 Separation	$ 4,328,200	$ 347,306	$ 7,200								
38	Rack 21 Separation	$ 2,199,500	$ 176,494	$ 10,400								
39	Rack 29/27 Treatment Basin	$ 1,934,100	$ 155,197	$ 104,000								
40	Inflow Elimination				$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
41	Nine Minimum Controls				$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
42	Miscellaneous Separations	$ 200,000			$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
43												
44	Totals	$ 340,253,500	$ 27,119,507	$ 36,846,600	$ 43,860,922	$ 45,430,983	$ 45,812,025	$ 46,196,877	$ 59,137,842	$ 59,412,449	$ 59,819,206	$ 60,230,030
45												
46	Projected 2002 Revenue			$ 33,800,000								
47	Projected Revenue [Existing Revenue x % Rate Increase]				$ 44,700,500	$ 44,700,500	$ 53,640,600	$ 53,640,600	$ 53,640,600	$ 53,640,600	$ 53,640,600	$ 65,441,532
	% Rate Increase Needed				0.0%	0.0%	20.0%	0.0%	0.0%	0.0%	0.0%	22.0%
48												
49	Subtotals			$ 33,800,000	$ 44,700,500	$ 44,700,500	$ 53,640,600	$ 53,640,600	$ 53,640,600	$ 53,640,600	$ 53,640,600	$ 65,441,532
50												
51	Totals				$ 44,700,500	$ 44,700,500	$ 53,640,600	$ 53,640,600	$ 53,640,600	$ 53,640,600	$ 53,640,600	$ 65,441,532
52												
53	Ending Balance				$ 25,866,251	$ 25,155,766	$ 32,984,343	$ 40,428,066	$ 34,930,823	$ 29,158,974	$ 22,980,368	$ 28,191,871
54												
55	Monthly Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)			27.94	$ 36.95	$ 36.95	$ 44.34	$ 44.34	$ 44.34	$ 44.34	$ 44.34	$ 54.09
56	Annual Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)				$ 443.40	$ 443.40	$ 532.08	$ 532.08	$ 532.08	$ 532.08	$ 532.08	$ 649.08

Notes
1. Capital Costs include preliminary engineering, design engineering, construction, construction inspection, construction engineering, and interest on bond anticipation notes.
2. Capital Costs are in 1998 dollars and are inflated at a rate of 2% per year to the year during which construction begins.
3. O&M Costs are in 1998 dollars and are inflated at a rate of 1% per year.
4. Debt Service is computed at 5% for 20 years.

CITY OF AKRON LTCP - 30 YEAR IMPLEMENTATION SCHEDULE WITH ADDITIONAL TREATMENT (5 YEAR INCREASES) FIGURE 5-5

LINE	ITEM	CAPITAL COST	DEBT SERVICE	ANNUAL O&M COST	2019	2020	2021	2022	2023	2024	2025	2026
1	Beginning Balance				$ 28,191,671	$ 29,627,483	$ 22,720,472	$ 15,088,987	$ 5,018,247	$ 5,598,410	$ 5,559,949	$ 4,020,132
2												
3	Projected 2002 Operation & Maintenance & Replacement			$ 33,600,000	$ 40,029,490	$ 40,429,785	$ 40,834,083	$ 41,242,423	$ 41,654,848	$ 42,071,396	$ 42,492,110	$ 42,917,031
4	Rack 39 Separation	$ 300,000	$ -	$ 1,900	$ 2,342	$ 2,365	$ 2,389	$ 2,412	$ 2,437	$ 2,461	$ 2,486	$ 2,510
5	Rack 9 Separation	$ 210,900	$ -	$ 2,000	$ 2,465	$ 2,489	$ 2,514	$ 2,539	$ 2,565	$ 2,591	$ 2,616	$ 2,643
6	Treatability/Pilot	$ 457,800	$ -	$ -								
7	Rack 40/31 Storage Basin Phase 1	$ 13,421,300	$ 1,076,960	$ 126,100	$ 1,419,700	$ 1,421,276	$ 1,422,873	$ 1,424,483	$ 1,426,110	$ 1,427,752	$ 1,429,412	$ 169,257
8	Post Construction Monitoring	$ 91,500	$ -	$ -								
9	Rack 26/28 Treatment Basin	$ 2,561,600	$ 205,549	$ 118,700	$ 396,649	$ 398,311	$ 399,789	$ 401,281	$ 402,788	$ 404,311	$ 405,848	$ 407,401
10	Separation 21/22 (partial)											
11	WPCS Storage Phase 1 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600	$ 2,804,890	$ 2,807,547	$ 2,810,231	$ 2,812,941	$ 2,815,679	$ 2,818,444	$ 2,821,236	$ 2,824,057
12	WPCS Phase 1a	$ 10,277,100	$ 824,661	$ 88,000	$ 1,175,238	$ 1,176,322	$ 1,177,417	$ 1,178,524	$ 1,179,641	$ 1,180,770	$ 1,181,909	$ 1,183,061
13	Treatability/Pilot/Post Construction Monitoring	$ 91,500	$ -	$ -								
14	CR Re-Aeration Structures	$ 750,000	$ -	$ 10,000	$ 335,726	$ 335,849	$ 335,973	$ 336,099	$ 336,226	$ 336,354	$ 336,484	$ 336,615
15	Rack 40/31 Storage Basin Phase 2	$ 11,192,300	$ 898,099	$ 103,800	$ 1,312,945	$ 1,314,224	$ 1,315,516	$ 1,316,821	$ 1,318,139	$ 1,319,470	$ 1,320,815	$ 1,322,173
16	Ohio Canal Tunnel Phase 1	$ 93,446,100	$ 7,498,357	$ 606,300	$ 11,493,167	$ 11,503,124	$ 11,513,160	$ 11,523,297	$ 11,533,535	$ 11,543,875	$ 11,554,319	$ 11,564,867
17	Post Construction Monitoring	$ 91,500	$ -	$ -								
18	LCR Stream Restoration	$ 6,103,800	$ 650,254	$ 50,000	$ 972,132	$ 972,746	$ 973,370	$ 973,999	$ 974,634	$ 975,275	$ 975,923	$ 976,577
19	OCI Phase 2	$ 47,945,500	$ 3,847,271	$ 274,100	Construction	$ 6,288,979	$ 6,292,391	$ 6,295,837	$ 6,299,317	$ 6,302,832	$ 6,306,383	$ 6,309,969
20	WPCS Storage Phase 2 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600	$ 3,360,958	$ 3,363,615	$ 3,366,299	$ 3,369,009	$ 3,371,747	$ 3,374,511	$ 3,377,304	$ 3,380,124
21	WPCS Storage Phase 2a	$ 10,277,100	$ 824,661	$ 88,000	Preliminary	Design	Construction	$ 1,439,152	$ 1,439,270	$ 1,440,398	$ 1,441,538	$ 1,442,689
22	WPCS Disinfection	$ 12,600,000	$ 1,011,057	$ 55,300	Construction	$ 1,631,906	$ 1,632,594	$ 1,633,289	$ 1,633,991	$ 1,634,701	$ 1,635,417	$ 1,636,140
23	Rack 14 Storage Basin	$ 1,984,800	$ 159,265	$ 34,500	Design	Construction	$ 294,518	$ 294,951	$ 295,390	$ 295,832	$ 296,279	$ 296,730
24	Rack 15 Storage Basin	$ 1,651,200	$ 132,497	$ 28,600	Preliminary	Design	Construction	$ 249,427	$ 249,780	$ 250,157	$ 250,527	$ 250,901
25	Rack 3 Treatment Basin	$ 1,700,100	$ 136,420	$ 76,600	Preliminary	Design	Construction	$ 316,685	$ 317,658	$ 318,640	$ 319,632	$ 320,635
26	Rack 12 Treatment Basin	$ 2,201,400	$ 176,646	$ 170,000		Preliminary	Design	Construction	$ 507,820	$ 510,000	$ 512,202	$ 514,426
27	North Side Tunnel	$ 28,371,900	$ 2,276,635	$ 172,000	Preliminary	Design	Construction	Construction	$ 3,955,639	$ 3,957,645	$ 3,960,072	$ 3,962,323
28	Post Construction Monitoring	$ 91,500	$ -	$ -					$ 150,115	Post Con. Mon.	Post Con. Mon.	
29	Rack 8 Separation	$ 2,326,400	$ 186,676	$ 4,600			Preliminary	Design	Construction	$ 318,346	$ 318,405	$ 318,466
30	Rack 30 Separation	$ 7,574,000	$ 607,757	$ 6,900				Preliminary	Design	Construction	$ 1,046,399	$ 1,046,490
31	Rack 36 Storage Basin	$ 992,800	$ 79,665	$ 20,000					Preliminary	Design	Construction	$ 165,124
32	Rack 10/11 Treatment Basin	$ 3,723,600	$ 298,791	$ 80,300							Preliminary	Design
33	Rack 40/31-NS Tunnel Phase 3	$ 12,326,100	$ 989,078	$ 117,700							Preliminary	Design
34	Rack 7/5 Storage Basin	$ 1,672,800	$ 134,230	$ 18,900								
35	Rack 22 Storage Basin	$ 1,283,000	$ 102,951	$ 29,200								
36	Rack 25 Separation	$ 2,974,500	$ 238,682	$ 8,300								
37	Rack 13 Separation	$ 4,328,200	$ 347,306	$ 7,200								
38	Rack 21 Separation	$ 2,199,500	$ 176,494	$ 10,400								
39	Rack 29/27 Treatment Basin	$ 1,934,100	$ 155,197	$ 104,000								
40	Inflow Elimination				$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
41	Nine Minimum Controls				$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
42	Miscellaneous Separations	$ 200,000			$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
43												
44	Totals	$ 340,253,500	$ 27,119,507	$ 36,846,600	$ 64,005,920	$ 72,348,543	$ 73,073,117	$ 75,512,172	$ 80,567,337	$ 81,185,961	$ 82,087,317	$ 82,050,207
45												
46	Projected 2002 Revenue			$ 33,000,000								
47	Projected Revenue [Existing Revenue x % Rate Increase]				$ 65,441,532	$ 65,441,532	$ 65,441,532	$ 65,441,532	$ 81,147,500	$ 81,147,500	$ 81,147,500	$ 81,147,500
	% Rate Increase Needed				0.0%	0.0%	0.0%	0.0%	24.0%	0.0%	0.0%	0.0%
48												
49	Subtotals			$ 33,600,000	$ 65,441,532	$ 65,441,532	$ 65,441,532	$ 65,441,532	$ 81,147,500	$ 81,147,500	$ 81,147,500	$ 81,147,500
50												
51	Totals				$ 65,441,532	$ 65,441,532	$ 65,441,532	$ 65,441,532	$ 81,147,500	$ 81,147,500	$ 81,147,500	$ 81,147,500
52												
53	Ending Balance				$ 29,627,483	$ 22,720,472	$ 15,088,987	$ 5,018,247	$ 5,598,410	$ 5,559,949	$ 4,020,132	$ 3,117,424
54												
55	Monthly Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)		27.94		$ 54.09	$ 54.09	$ 54.09	$ 54.09	$ 67.07	$ 67.07	$ 67.07	$ 67.07
56	Annual Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)				$ 649.08	$ 649.08	$ 649.08	$ 649.08	$ 804.84	$ 804.84	$ 804.84	$ 804.84

Notes
1. Capital Costs include preliminary engineering, design engineering, construction, construction inspection, construction engineering, and interest on bond anticipation notes.
2. Capital Costs are in 1998 dollars and are inflated at a rate of 2% per year to the year during which construction begins.
3. O&M Costs are in 1998 dollars and are inflated at a rate of 1% per year.
4. Debt Service is computed at 5% for 20 years.

CITY OF AKRON LTCP - 30 YEAR IMPLEMENTATION SCHEDULE WITH ADDITIONAL TREATMENT (5 YEAR INCREASES) FIGURE 5-5

LINE	ITEM	CAPITAL COST	DEBT SERVICE	ANNUAL O&M COST	2027	2028	2029	2030	2031	2032	2033	2034
1	Beginning Balance				$ 3,117,424	$ 1,750,260	$ 1,622,261	$ 3,556,988	$ 4,731,542	$ 6,296,054	$ 8,511,115	$ 9,692,978
2												
3	Projected 2002 Operation & Maintenance & Replacement			$ 33,800,000	$ 43,346,207	$ 43,779,663	$ 44,217,460	$ 44,659,635	$ 45,106,231	$ 45,557,293	$ 46,012,866	$ 46,472,995
4	Rack 39 Separation	$ 300,000	$ -	$ 1,900	$ 2,536	$ 2,561	$ 2,587	$ 2,612	$ 2,639	$ 2,665	$ 2,692	$ 2,718
5	Rack 9 Separation	$ 210,900	$ -	$ 2,000	$ 2,669	$ 2,696	$ 2,723	$ 2,750	$ 2,777	$ 2,805	$ 2,833	$ 2,862
6	Treatability/Pilot	$ 457,600	$ -	$ -								
7	Rack 40/31 Storage Basin Phase 1	$ 13,421,300	$ 1,076,980	$ 128,100	$ 170,950	$ 172,659	$ 174,385	$ 176,130	$ 177,891	$ 179,670	$ 181,467	$ 183,281
8	Post Construction Monitoring	$ 91,500	$ -	$ -								
9	Rack 26/28 Treatment Basin	$ 2,561,600	$ 205,549	$ 116,700	$ 408,969	$ 159,980	$ 161,590	$ 163,205	$ 164,838	$ 166,486	$ 168,151	$ 169,832
10	Separation 21/22 (partial)											
11	WPCS Storage Phase 1 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600	$ 2,826,906	$ 2,829,783	$ 293,502	$ 296,437	$ 299,402	$ 302,396	$ 305,420	$ 308,474
12	WPCS Phase 1a	$ 10,277,100	$ 824,661	$ 88,000	$ 1,184,223	$ 1,185,396	$ 1,186,584	$ 1,187,782	$ 122,205	$ 123,427	$ 124,661	$ 125,908
13	Treatability/Pilot/Post Construction Monitoring	$ 91,500	$ -	$ -								
14	CR Re-Aeration Structures	$ 750,000	$ -	$ 10,000	$ 336,747	$ 336,880	$ 337,015	$ 337,151	$ 337,289	$ 14,026	$ 14,166	$ 14,308
15	Rack 40/31 Storage Basin Phase 2	$ 11,192,300	$ 898,099	$ 103,600	$ 1,323,544	$ 1,324,929	$ 1,326,326	$ 1,327,742	$ 1,329,169	$ 145,587	$ 147,043	$ 148,514
16	Ohio Canal Tunnel Phase 1	$ 93,446,100	$ 7,498,357	$ 806,300	$ 11,575,520	$ 11,596,260	$ 11,597,146	$ 11,608,124	$ 11,619,211	$ 11,630,408	$ 11,641,717	$ 11,653,139
17	Post Construction Monitoring	$ 91,500	$ -	$ -								
18	LCR Stream Restoration	$ 8,103,600	$ 650,254	$ 50,000	$ 977,238	$ 977,905	$ 978,579	$ 979,259	$ 979,947	$ 980,641	$ 981,342	$ 982,051
19	OCI Phase 2	$ 47,945,500	$ 3,847,271	$ 274,100	$ 6,313,590	$ 6,317,248	$ 6,320,943	$ 6,324,674	$ 6,328,443	$ 6,332,249	$ 6,336,094	$ 6,339,976
20	WPCS Storage Phase 2 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600	$ 3,362,973	$ 3,365,850	$ 3,368,756	$ 3,371,691	$ 3,374,656	$ 3,377,650	$ 3,400,674	$ 3,403,728
21	WPCS Storage Phase 2a	$ 10,277,100	$ 824,661	$ 86,000	$ 1,443,852	$ 1,445,026	$ 1,446,212	$ 1,447,410	$ 1,448,620	$ 1,449,842	$ 1,451,077	$ 1,452,323
22	WPCS Disinfection	$ 12,600,000	$ 1,011,057	$ 55,300	$ 1,636,871	$ 1,637,609	$ 1,638,354	$ 1,639,107	$ 1,639,866	$ 1,640,635	$ 1,641,411	$ 1,642,194
23	Rack 14 Storage Basin	$ 1,984,800	$ 159,285	$ 34,500	$ 297,196	$ 297,646	$ 298,111	$ 298,581	$ 299,056	$ 299,535	$ 300,018	$ 300,507
24	Rack 15 Storage Basin	$ 1,651,200	$ 132,497	$ 26,600	$ 251,278	$ 251,661	$ 252,046	$ 252,436	$ 252,829	$ 253,226	$ 253,627	$ 254,032
25	Rack 3 Treatment Basin	$ 1,700,100	$ 136,420	$ 78,600	$ 321,647	$ 322,669	$ 323,701	$ 324,744	$ 325,797	$ 326,861	$ 327,935	$ 329,021
26	Rack 12 Treatment Basin	$ 2,201,400	$ 176,646	$ 170,000	$ 516,672	$ 518,941	$ 521,232	$ 523,546	$ 525,884	$ 528,245	$ 530,629	$ 533,037
27	North Side Tunnel	$ 28,371,900	$ 2,276,635	$ 172,000	$ 3,964,595	$ 3,966,690	$ 3,969,209	$ 3,971,550	$ 3,973,915	$ 3,976,304	$ 3,978,716	$ 3,981,153
28	Post Construction Monitoring	$ 91,500	$ -	$ -								
29	Rack 8 Separation	$ 2,326,400	$ 186,676	$ 4,600	$ 316,526	$ 316,588	$ 316,650	$ 316,712	$ 316,776	$ 316,839	$ 316,904	$ 316,969
30	Rack 30 Separation	$ 7,574,000	$ 607,757	$ 6,900	$ 1,046,561	$ 1,046,673	$ 1,046,786	$ 1,046,660	$ 1,046,955	$ 1,047,051	$ 1,047,147	$ 1,047,245
31	Rack 36 Storage Basin	$ 992,600	$ 79,665	$ 20,000	$ 165,388	$ 165,655	$ 165,925	$ 166,197	$ 166,472	$ 166,750	$ 167,030	$ 167,314
32	Rack 10/11 Treatment Basin	$ 3,723,600	$ 298,791	$ 80,300	Construction	$ 649,451	$ 650,534	$ 651,627	$ 652,731	$ 653,846	$ 654,972	$ 656,110
33	Rack 40/31-NS Tunnel Phase 3	$ 12,326,100	$ 989,078	$ 117,700	Construction	$ 1,950,220	$ 1,951,806	$ 1,953,409	$ 1,955,027	$ 1,956,661	$ 1,958,312	$ 1,959,980
34	Rack 7/5 Storage Basin	$ 1,672,800	$ 134,230	$ 18,900	Preliminary	Design	Construction	$ 278,948	$ 279,208	$ 279,470	$ 279,735	$ 280,003
35	Rack 22 Storage Basin	$ 1,263,000	$ 102,951	$ 29,200		Preliminary	Design	Construction	$ 190,530	$ 190,935	$ 191,345	$ 191,759
36	Rack 25 Separation	$ 2,974,500	$ 238,682	$ 8,300			Preliminary	Design	Construction	$ 366,310	$ 366,426	$ 366,544
37	Rack 13 Separation	$ 4,326,200	$ 347,306	$ 7,200				Preliminary	Design	Construction	$ 536,600	$ 536,701
38	Rack 21 Separation	$ 2,199,500	$ 176,494	$ 10,400					Preliminary	Design	Construction	$ 287,735
39	Rack 29/27 Treatment Basin	$ 1,934,100	$ 155,197	$ 104,000					Preliminary	Design	Construction	$ 466,385
40	Inflow Elimination				$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
41	Nine Minimum Controls				$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
42	Miscellaneous Separations	$ 200,000			$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
43												
44	Totals	$ 340,253,500	$ 27,119,507	$ 36,846,600	$ 82,514,664	$ 85,332,873	$ 83,270,148	$ 84,030,321	$ 83,640,362	$ 82,989,814	$ 84,023,012	$ 85,277,798
45												
46	Projected 2002 Revenue			$ 33,800,000								
47	Projected Revenue [Existing Revenue x % Rate Increase]				$ 81,147,500	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875
	% Rate Increase Needed				0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
48												
49	Subtotals			$ 33,800,000	$ 81,147,500	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875
50												
51	Totals				$ 81,147,500	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875	$ 85,204,875
52												
53	Ending Balance				$ 1,750,260	$ 1,622,261	$ 3,556,988	$ 4,731,542	$ 6,296,054	$ 8,511,115	$ 9,692,978	$ 9,620,055
54												
55	Monthly Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)			27.94	$ 67.07	$ 70.42	$ 70.42	$ 70.42	$ 70.42	$ 70.42	$ 70.42	$ 70.42
56	Annual Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)				$ 804.84	$ 845.04	$ 845.04	$ 845.04	$ 845.04	$ 845.04	$ 845.04	$ 845.04

Notes
1. Capital Costs include preliminary engineering, design engineering, construction, construction inspection, construction engineering, and interest on bond anticipation notes.
2. Capital Costs are in 1998 dollars and are inflated at a rate of 2% per year to the year during which construction begins.
3. O&M Costs are in 1998 dollars and are inflated at a rate of 1% per year.
4. Debt Service is computed at 5% for 20 years.

CITY OF AKRON LTCP - 30 YEAR IMPLEMENTATION SCHEDULE WITH ADDITIONAL TREATMENT (YEARLY INCREASES) FIGURE 5-4

LINE	ITEM	CAPITAL COST	DEBT SERVICE	ANNUAL O&M COST	2003	2004	2005	2006	2007	2008	2009	2010
1	Beginning Balance				$ -	$ 151,552	$ 1,275,084	$ 3,022,180	$ 3,656,751	$ 4,809,794	$ 5,998,097	$ 4,836,253
2												
3	Projected 2002 Operation & Maintenance & Replacement			$ 33,800,000	$ 34,138,000	$ 34,479,380	$ 34,824,174	$ 35,172,416	$ 35,524,140	$ 35,879,381	$ 36,238,175	$ 36,600,557
4	Rack 39 Separation	$ 300,000	$ -	$ 1,900	$ 333,221	$ 2,017	$ 2,037	$ 2,057	$ 2,078	$ 2,099	$ 2,120	$ 2,141
5	Rack 8 Separation	$ 210,900	$ -	$ 2,000	Construction	$ 238,631	$ 2,144	$ 2,166	$ 2,187	$ 2,209	$ 2,231	$ 2,254
6	Treatability/Pilot	$ 457,800	$ -	$ -	$ 505,227	Treat./Pilot						
7	Rack 40/31 Storage Basin Phase 1	$ 13,421,300	$ 1,076,960	$ 126,100	Preliminary	Design/Const.	Construction	$ 1,400,544	$ 1,401,931	$ 1,403,332	$ 1,404,747	$ 1,406,176
8	Post Construction Monitoring	$ 91,500	$ -	$ -				$ 107,207	Post Con. Mon.	Post Con. Mon.		
9	Rack 26/28 Treatment Basin	$ 2,561,800	$ 205,549	$ 118,700			Preliminary	Design	Construction	$ 381,682	$ 382,993	$ 384,316
10	Separation 21/22 (partial)											
11	WPCS Storage Phase 1 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600				Preliminary	Design	Construction	$ 2,779,725	$ 2,782,130
12	WPCS Phase 1a	$ 10,277,100	$ 824,661	$ 88,000						Preliminary	Design	Construction
13	Treatability/Pilot/Post Construction Monitoring	$ 91,500	$ -	$ -								
14	CR Re-Aeration Structures	$ 750,000	$ -	$ 10,000						Preliminary	Design	Construction
15	Rack 40/31 Storage Basin Phase 2	$ 11,192,300	$ 898,099	$ 103,800							Preliminary	Design
16	Ohio Canal Tunnel Phase 1	$ 93,446,100	$ 7,498,357	$ 805,300								
17	Post Construction Monitoring	$ 91,500	$ -	$ -								
18	LCR Stream Restoration	$ 8,103,600	$ 650,254	$ 50,000								
19	OCI Phase 2	$ 47,945,500	$ 3,847,271	$ 274,100								
20	WPCS Storage Phase 2 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600								
21	WPCS Storage Phase 2a	$ 10,277,100	$ 824,661	$ 88,000								
22	WPCS Disinfection	$ 12,600,000	$ 1,011,057	$ 55,300								
23	Rack 14 Storage Basin	$ 1,984,800	$ 159,265	$ 34,500								
24	Rack 15 Storage Basin	$ 1,651,200	$ 132,497	$ 28,600								
25	Rack 3 Treatment Basin	$ 1,700,100	$ 136,420	$ 76,600								
26	Rack 12 Treatment Basin	$ 2,201,400	$ 176,646	$ 170,000								
27	North Side Tunnel	$ 26,371,900	$ 2,276,635	$ 172,000								
28	Post Construction Monitoring	$ 91,500	$ -	$ -								
29	Rack 8 Separation	$ 2,326,400	$ 186,676	$ 4,600								
30	Rack 30 Separation	$ 7,574,000	$ 607,757	$ 6,900								
31	Rack 36 Storage Basin	$ 992,800	$ 79,665	$ 20,000								
32	Rack 10/11 Treatment Basin	$ 3,723,600	$ 298,791	$ 80,300								
33	Rack 40/31-NS Tunnel Phase 3	$ 12,326,100	$ 989,076	$ 117,700								
34	Rack 7/5 Storage Basin	$ 1,672,800	$ 134,230	$ 18,900								
35	Rack 22 Storage Basin	$ 1,283,000	$ 102,951	$ 29,200								
36	Rack 25 Separation	$ 2,974,500	$ 238,682	$ 8,300								
37	Rack 13 Separation	$ 4,326,200	$ 347,306	$ 7,200								
38	Rack 21 Separation	$ 2,199,500	$ 176,494	$ 10,400								
39	Rack 29/27 Treatment Basin	$ 1,934,100	$ 155,197	$ 104,000								
40	Inflow Elimination				$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
41	Nine Minimum Controls				$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
42	Miscellaneous Separations	$ 200,000			$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
43												
44	Totals	$ 340,253,500	$ 27,119,507	$ 36,846,600	$ 35,676,449	$ 35,421,028	$ 35,528,355	$ 37,384,390	$ 37,630,336	$ 38,368,704	$ 41,509,991	$ 41,877,575
45												
46	Projected 2002 Revenue			$ 33,800,000								
47	Projected Revenue [Existing Revenue x % Rate Increase]				$ 35,828,000	$ 36,544,560	$ 37,275,451	$ 38,020,960	$ 38,781,379	$ 39,557,007	$ 40,348,147	$ 42,365,555
	% Rate Increase Needed				6.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	5.0%
48												
49	Subtotals			$ 33,800,000	$ 35,828,000	$ 36,544,560	$ 37,275,451	$ 38,020,960	$ 38,781,379	$ 39,557,007	$ 40,348,147	$ 42,365,555
50												
51	Totals					$ 36,544,560	$ 37,275,451	$ 38,020,960	$ 38,781,379	$ 39,557,007	$ 40,348,147	$ 42,365,555
52												
53	Ending Balance				$ 151,552	$ 1,275,084	$ 3,022,180	$ 3,656,751	$ 4,809,794	$ 5,998,097	$ 4,836,253	$ 5,324,233
54												
55	Monthly Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)			27.94	$ 29.62	$ 30.21	$ 30.81	$ 31.43	$ 32.06	$ 32.70	$ 33.35	$ 35.02
56	Annual Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)				$ 355.40	$ 362.52	$ 369.72	$ 377.16	$ 384.72	$ 392.40	$ 400.20	$ 420.24

Notes:
1. Capital Costs include preliminary engineering, design engineering, construction, construction inspection, construction engineering, and interest on bond anticipation notes.
2. Capital Costs are in 1998 dollars and are inflated at a rate of 2% per year to the year during which construction begins.
3. O&M Costs are in 1998 dollars and are inflated at a rate of 1% per year.
4. Debt Service is computed at 5% for 20 years.

CITY OF AKRON LTCP - 30 YEAR IMPLEMENTATION SCHEDULE WITH ADDITIONAL TREATMENT (YEARLY INCREASES) FIGURE 5-4

LINE	ITEM	CAPITAL COST	DEBT SERVICE	ANNUAL O&M COST	2011	2012	2013	2014	2015	2016	2017	2018
1	Beginning Balance				$ 5,324,233	$ 5,939,143	$ 7,216,184	$ 10,447,584	$ 15,746,303	$ 10,606,958	$ 6,166,404	$ 7,961,786
2												
3	Projected 2002 Operation & Maintenance & Replacement			$ 33,800,000	$ 36,966,562	$ 37,336,228	$ 37,709,590	$ 38,086,686	$ 38,467,553	$ 36,852,228	$ 39,240,751	$ 39,633,159
4	Rack 39 Separation	$ 305,000	$ -	$ 1,900	$ 2,162	$ 2,184	$ 2,206	$ 2,228	$ 2,250	$ 2,273	$ 2,295	$ 2,318
5	Rack 9 Separation	$ 210,900	$ -	$ 2,000	$ 2,276	$ 2,299	$ 2,322	$ 2,345	$ 2,369	$ 2,392	$ 2,416	$ 2,440
6	Treatability/Pilot	$ 457,600	$ -	$ -								
7	Rack 40/31 Storage Basin Phase 1	$ 13,421,300	$ 1,076,960	$ 129,100	$ 1,407,620	$ 1,409,078	$ 1,410,550	$ 1,412,037	$ 1,413,539	$ 1,415,057	$ 1,416,589	$ 1,418,136
8	Post Construction Monitoring	$ 91,500	$ -	$ -								
9	Rack 26/28 Treatment Basin	$ 2,561,600	$ 205,549	$ 118,700	$ 365,655	$ 367,006	$ 368,371	$ 369,749	$ 391,141	$ 392,546	$ 393,965	$ 395,400
10	Separation 21/22 (partial)											
11	WPCS Storage Phase 1 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600	$ 2,784,559	$ 2,787,013	$ 2,789,491	$ 2,791,994	$ 2,794,523	$ 2,797,076	$ 2,799,655	$ 2,802,259
12	WPCS Phase 1a	$ 10,277,100	$ 824,661	$ 88,000	$ 1,166,939	$ 1,167,941	$ 1,168,952	$ 1,169,974	$ 1,171,006	$ 1,172,048	$ 1,173,101	$ 1,174,164
13	Treatability/Pilot/Post Construction Monitoring	$ 91,500	$ -	$ -	$ 118,365	Post Con. Mon.	Post Con. Mon.					
14	CR Re-Aeration Structures	$ 750,000	$ -	$ 10,000	$ 334,783	$ 334,896	$ 335,011	$ 335,127	$ 335,245	$ 335,363	$ 335,483	$ 335,604
15	Rack 40/31 Storage Basin Phase 2	$ 11,192,300	$ 898,099	$ 103,800	Construction	$ 1,304,338	$ 1,305,531	$ 1,306,736	$ 1,307,954	$ 1,309,183	$ 1,310,424	$ 1,311,678
16	Ohio Canal Tunnel Phase 1	$ 93,446,100	$ 7,498,357	$ 806,300	Preliminary	Design	Construction	Construction	$ 11,454,414	$ 11,463,964	$ 11,473,608	$ 11,483,349
17	Post Construction Monitoring	$ 91,500	$ -	$ -					$ -	Post Con. Mon.	Post Con. Mon.	
18	LCR Stream Restoration	$ 6,103,600	$ 650,254	$ 50,000		Preliminary	Design	Construction	$ 969,728	$ 970,320	$ 970,918	$ 971,522
19	OCI Phase 2	$ 47,945,500	$ 3,847,271	$ 274,100							Preliminary	Design
20	WPCS Storage Phase 2 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600						Preliminary	Design	Construction
21	WPCS Storage Phase 2a	$ 10,277,100	$ 824,661	$ 88,000								
22	WPCS Disinfection	$ 12,600,000	$ 1,011,057	$ 55,300							Preliminary	Design
23	Rack 14 Storage Basin	$ 1,984,800	$ 159,265	$ 34,500								Preliminary
24	Rack 15 Storage Basin	$ 1,651,200	$ 132,497	$ 28,600								
25	Rack 3 Treatment Basin	$ 1,700,100	$ 136,420	$ 78,600								
26	Rack 12 Treatment Basin	$ 2,201,400	$ 176,646	$ 170,000								
27	North Side Tunnel	$ 28,371,900	$ 2,276,635	$ 172,000								
28	Post Construction Monitoring	$ 91,500	$ -	$ -								
29	Rack 8 Separation	$ 2,326,400	$ 186,676	$ 4,600								
30	Rack 30 Separation	$ 7,574,000	$ 607,757	$ 6,900								
31	Rack 36 Storage Basin	$ 992,800	$ 79,685	$ 20,000								
32	Rack 10/11 Treatment Basin	$ 3,723,600	$ 298,791	$ 80,300								
33	Rack 40/31-NS Tunnel Phase 3	$ 12,326,100	$ 989,078	$ 117,700								
34	Rack 7/5 Storage Basin	$ 1,672,800	$ 134,230	$ 18,900								
35	Rack 22 Storage Basin	$ 1,263,000	$ 102,951	$ 29,200								
36	Rack 25 Separation	$ 2,974,500	$ 238,682	$ 8,300								
37	Rack 13 Separation	$ 4,326,200	$ 347,306	$ 7,200								
38	Rack 21 Separation	$ 2,199,500	$ 176,494	$ 10,400								
39	Rack 29/27 Treatment Basin	$ 1,934,100	$ 155,197	$ 104,000								
40	Inflow Elimination				$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
41	Nine Minimum Controls				$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
42	Miscellaneous Separations	$ 200,000			$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
43												
44	Totals	$ 340,253,500	$ 27,119,507	$ 36,846,600	$ 43,868,922	$ 45,430,983	$ 45,812,025	$ 46,196,077	$ 59,009,720	$ 59,412,449	$ 59,818,206	$ 60,230,030
45												
46	Projected 2002 Revenue			$ 33,800,000								
47	Projected Revenue [Existing Revenue x % Rate Increase]				$ 44,483,832	$ 46,708,024	$ 49,043,425	$ 51,495,596	$ 54,070,376	$ 56,773,895	$ 59,612,590	$ 62,593,219
	% Rate Increase Needed				5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
48												
49	Subtotals			$ 33,800,000	$ 44,483,832	$ 46,708,024	$ 49,043,425	$ 51,495,596	$ 54,070,376	$ 56,773,895	$ 59,612,590	$ 62,593,219
50												
51	Totals				$ 44,483,832	$ 46,708,024	$ 49,043,425	$ 51,495,596	$ 54,070,376	$ 56,773,895	$ 59,612,590	$ 62,593,219
52												
53	Ending Balance				$ 5,939,143	$ 7,216,184	$ 10,447,584	$ 15,746,303	$ 10,606,958	$ 8,166,404	$ 7,961,786	$ 10,324,978
54												
55	Monthly Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)			27.94	$ 36.77	$ 38.61	$ 40.54	$ 42.57	$ 44.70	$ 46.94	$ 49.29	$ 51.75
56	Annual Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)				$ 441.24	$ 463.32	$ 486.48	$ 510.84	$ 536.40	$ 563.28	$ 591.48	$ 621.00

Notes:

1. Capital Costs include preliminary engineering, design engineering, construction, construction inspection, construction engineering, and interest on bond anticipation notes.
2. Capital Costs are in 1998 dollars and are inflated at a rate of 2% per year to the year during which construction begins.
3. O&M Costs are in 1998 dollars and are inflated at a rate of 1% per year.
4. Debt Service is computed at 5% for 20 years.

CITY OF AKRON LTCP - 30 YEAR IMPLEMENTATION SCHEDULE WITH ADDITIONAL TREATMENT (YEARLY INCREASES) FIGURE 5-4

LINE	ITEM	CAPITAL COST	DEBT SERVICE	ANNUAL O&M COST	2019	2020	2021	2022	2023	2024	2025	2026
1	Beginning Balance				$ 10,324,978	$ 12,041,938	$ 8,702,419	$ 7,398,687	$ 6,526,676	$ 3,585,106	$ 3,129,943	$ 4,402,655
2												
3	Projected 2002 Operation & Maintenance & Replacement			$ 33,800,000	$ 40,029,490	$ 40,429,785	$ 40,834,083	$ 41,242,423	$ 41,654,848	$ 42,071,396	$ 42,492,110	$ 42,917,031
4	Rack 39 Separation	$ 300,000	$ -	$ 1,900	$ 2,342	$ 2,365	$ 2,389	$ 2,412	$ 2,437	$ 2,461	$ 2,486	$ 2,510
5	Rack 8 Separation	$ 210,900	$ -	$ 2,000	$ 2,465	$ 2,489	$ 2,514	$ 2,539	$ 2,565	$ 2,591	$ 2,616	$ 2,643
6	Treatability/Pilot	$ 457,600	$ -	$ -								
7	Rack 40/31 Storage Basin Phase 1	$ 13,421,300	$ 1,076,960	$ 128,100	$ 1,419,700	$ 1,421,278	$ 1,422,873	$ 1,424,483	$ 1,426,110	$ 1,427,752	$ 1,429,412	$ 169,257
8	Post Construction Monitoring	$ 91,500	$ -	$ -								
9	Rack 26/28 Treatment Basin	$ 2,561,600	$ 205,549	$ 118,700	$ 396,649	$ 398,311	$ 399,789	$ 401,281	$ 402,788	$ 404,311	$ 405,848	$ 407,401
10	Separation 21/22 (partial)											
11	WPCS Storage Phase 1 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,500	$ 2,804,890	$ 2,807,547	$ 2,810,231	$ 2,812,941	$ 2,815,679	$ 2,818,444	$ 2,821,236	$ 2,824,057
12	WPCS Phase 1a	$ 10,277,100	$ 824,661	$ 88,000	$ 1,175,238	$ 1,176,322	$ 1,177,417	$ 1,178,524	$ 1,179,641	$ 1,180,770	$ 1,181,909	$ 1,183,061
13	Treatability/Pilot/Post Construction Monitoring	$ 91,500	$ -	$ -								
14	CR Re-Aeration Structures	$ 750,000	$ -	$ 10,000	$ 335,726	$ 335,849	$ 335,973	$ 336,099	$ 336,226	$ 336,354	$ 336,484	$ 336,615
15	Rack 40/31 Storage Basin Phase 2	$ 11,192,300	$ 898,099	$ 103,800	$ 1,312,945	$ 1,314,224	$ 1,315,516	$ 1,316,821	$ 1,318,139	$ 1,319,470	$ 1,320,815	$ 1,322,173
16	Ohio Canal Tunnel Phase 1	$ 93,446,100	$ 7,498,357	$ 806,300	$ 11,493,187	$ 11,503,124	$ 11,513,160	$ 11,523,297	$ 11,533,535	$ 11,543,875	$ 11,554,319	$ 11,564,867
17	Post Construction Monitoring	$ 91,500	$ -	$ -								
18	LCR Stream Restoration	$ 6,103,600	$ 650,254	$ 50,000	$ 972,132	$ 972,748	$ 973,370	$ 973,999	$ 974,634	$ 975,275	$ 975,923	$ 976,577
19	OCI Phase 2	$ 47,945,500	$ 3,847,271	$ 274,100	Construction	$ 6,288,979	$ 6,292,391	$ 6,295,837	$ 6,299,317	$ 6,302,832	$ 6,306,383	$ 6,309,969
20	WPCS Storage Phase 2 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,500	$ 3,360,958	$ 3,363,615	$ 3,366,299	$ 3,369,009	$ 3,371,747	$ 3,374,511	$ 3,377,304	$ 3,380,124
21	WPCS Storage Phase 2a	$ 10,277,100	$ 824,661	$ 88,000	Preliminary	Design	Construction	$ 1,436,152	$ 1,439,270	$ 1,440,398	$ 1,441,538	$ 1,442,699
22	WPCS Disinfection	$ 12,600,000	$ 1,011,057	$ 55,300	Construction	$ 1,631,906	$ 1,632,594	$ 1,633,289	$ 1,633,991	$ 1,634,701	$ 1,635,417	$ 1,636,140
23	Rack 14 Storage Basin	$ 1,984,800	$ 159,285	$ 34,500	Design	Construction	$ 294,518	$ 294,951	$ 295,390	$ 295,832	$ 296,279	$ 296,730
24	Rack 15 Storage Basin	$ 1,651,200	$ 132,497	$ 28,600	Preliminary	Design	Construction	$ 249,427	$ 249,799	$ 250,157	$ 250,527	$ 250,901
25	Rack 3 Treatment Basin	$ 1,700,100	$ 136,420	$ 76,600	Preliminary	Design	Construction	$ 316,685	$ 317,658	$ 316,640	$ 319,632	$ 320,635
26	Rack 12 Treatment Basin	$ 2,201,400	$ 176,646	$ 170,000		Preliminary	Design	Construction	$ 507,820	$ 510,000	$ 512,202	$ 514,426
27	North Side Tunnel	$ 28,371,900	$ 2,276,635	$ 172,000	Preliminary	Design	Construction	Construction	$ 3,955,639	$ 3,957,845	$ 3,960,072	$ 3,962,323
28	Post Construction Monitoring	$ 91,500	$ -	$ -					$ 150,115	Post Con. Mon.	Post Con. Mon.	
29	Rack 8 Separation	$ 2,326,400	$ 186,676	$ 4,600			Preliminary	Design	Construction	$ 318,346	$ 318,405	$ 318,466
30	Rack 30 Separation	$ 7,574,000	$ 607,757	$ 6,900				Preliminary	Design	Construction	$ 1,046,399	$ 1,046,490
31	Rack 36 Storage Basin	$ 992,800	$ 79,665	$ 20,000					Preliminary	Design	Construction	$ 165,124
32	Rack 10/11 Treatment Basin	$ 3,723,600	$ 298,791	$ 80,300							Preliminary	Design
33	Rack 40/31-NS Tunnel Phase 3	$ 12,326,100	$ 989,076	$ 117,700							Preliminary	Design
34	Rack 7/5 Storage Basin	$ 1,672,800	$ 134,230	$ 18,900								
35	Rack 22 Storage Basin	$ 1,283,000	$ 102,951	$ 29,200								
36	Rack 25 Separation	$ 2,974,500	$ 238,682	$ 8,300								
37	Rack 13 Separation	$ 4,328,200	$ 347,306	$ 7,200								
38	Rack 21 Separation	$ 2,199,500	$ 176,494	$ 10,400								
39	Rack 29/27 Treatment Basin	$ 1,934,100	$ 155,197	$ 104,000								
40	Inflow Elimination				$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
41	Nine Minimum Controls				$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
42	Miscellaneous Separations	$ 200,000			$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
43												
44	Totals	$ 340,253,500	$ 27,119,507	$ 36,846,600	$ 64,005,920	$ 72,348,543	$ 73,073,117	$ 75,512,172	$ 80,567,337	$ 81,185,961	$ 82,887,317	$ 82,050,207
45												
46	Projected 2002 Revenue			$ 33,800,000								
47	Projected Revenue [Existing Revenue x % Rate Increase]				$ 65,722,880	$ 69,009,024	$ 71,769,385	$ 74,640,161	$ 77,625,767	$ 80,730,798	$ 83,960,030	$ 83,960,029
	% Rate Increase Needed				5.0%	5.0%	4.0%	4.0%	4.0%	4.0%	4.0%	0.0%
48												
49	Subtotals			$ 33,800,000	$ 65,722,880	$ 69,009,024	$ 71,769,385	$ 74,640,161	$ 77,625,767	$ 80,730,798	$ 83,960,030	$ 83,960,029
50												
51	Totals				$ 65,722,880	$ 69,009,024	$ 71,769,385	$ 74,640,161	$ 77,625,767	$ 80,730,798	$ 83,960,030	$ 83,960,029
52												
53	Ending Balance				$ 12,041,938	$ 8,702,419	$ 7,398,687	$ 6,526,676	$ 3,585,106	$ 3,129,943	$ 4,402,655	$ 6,312,477
54												
55	Monthly Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)			27.94	$ 54.34	$ 57.06	$ 59.34	$ 61.71	$ 64.18	$ 66.75	$ 69.42	$ 69.42
56	Annual Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)				$ 652.08	$ 684.72	$ 712.08	$ 740.52	$ 770.16	$ 801.00	$ 833.04	$ 833.04

Notes:

1. Capital Costs include preliminary engineering, design engineering, construction, construction inspection, construction enginnering, and interest on bond anticipation notes.
2. Capital Costs are in 1998 dollars and are inflated at a rate of 2% per year to the year during which construction begins.
3. O&M Costs are in 1998 dollars and are inflated at a rate of 1% per year.
4. Debt Service is computed at 5% for 20 years.

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CITY OF AKRON LTCP - 30 YEAR IMPLEMENTATION SCHEDULE WITH ADDITIONAL TREATMENT (YEARLY INCREASES) FIGURE 5-4

LINE	ITEM	CAPITAL COST	DEBT SERVICE	ANNUAL O&M COST	2027	2028	2029	2030	2031	2032	2033	2034
1	Beginning Balance				$ 8,312,477	$ 7,757,843	$ 6,384,999	$ 7,074,881	$ 7,004,589	$ 7,324,257	$ 8,294,472	$ 8,231,490
2												
3	Projected 2002 Operation & Maintenance & Replacement			$ 33,800,000	$ 43,346,201	$ 43,779,663	$ 44,217,460	$ 44,659,635	$ 45,106,231	$ 45,557,293	$ 46,012,866	$ 46,472,995
4	Rack 39 Separation	$ 300,000	$ -	$ 1,900	$ 2,536	$ 2,561	$ 2,587	$ 2,612	$ 2,639	$ 2,665	$ 2,692	$ 2,718
5	Rack 8 Separation	$ 210,900	$ -	$ 2,000	$ 2,669	$ 2,696	$ 2,723	$ 2,750	$ 2,777	$ 2,805	$ 2,833	$ 2,862
6	Treatability/Pilot	$ 457,800	$ -	$ -								
7	Rack 40/31 Storage Basin Phase 1	$ 13,421,300	$ 1,076,960	$ 128,100	$ 170,950	$ 172,659	$ 174,386	$ 176,130	$ 177,891	$ 179,670	$ 181,467	$ 183,281
8	Post Construction Monitoring	$ 91,500	$ -	$ -								
9	Rack 28/28 Treatment Basin	$ 2,561,600	$ 205,549	$ 118,700	$ 158,369	$ 159,990	$ 161,590	$ 163,205	$ 164,836	$ 166,486	$ 168,151	$ 169,832
10	Separation 21/22 (partial)											
11	WPCS Storage Phase 1 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600	$ 2,826,906	$ 2,829,783	$ 293,502	$ 296,437	$ 299,402	$ 302,396	$ 305,420	$ 308,474
12	WPCS Phase 1a	$ 10,277,100	$ 824,661	$ 66,000	$ 1,184,223	$ 1,185,398	$ 1,186,584	$ 1,187,782	$ 122,205	$ 123,427	$ 124,661	$ 125,908
13	Treatability/Pilot/Post Construction Monitoring	$ 91,500	$ -	$ -								
14	CR Re-Aeration Structures	$ 750,000	$ -	$ 10,000	$ 336,747	$ 336,680	$ 337,015	$ 337,151	$ 337,289	$ 14,026	$ 14,166	$ 14,308
15	Rack 40/31 Storage Basin Phase 2	$ 11,192,300	$ 898,099	$ 103,800	$ 1,323,544	$ 1,324,829	$ 1,326,328	$ 1,327,742	$ 1,329,169	$ 145,587	$ 147,043	$ 148,514
16	Ohio Canal Tunnel Phase 1	$ 93,446,100	$ 7,498,357	$ 806,300	$ 11,575,520	$ 11,586,280	$ 11,597,148	$ 11,608,124	$ 11,619,211	$ 11,630,408	$ 11,641,717	$ 11,653,139
17	Post Construction Monitoring	$ 91,500	$ -	$ -								
18	LCR Stream Restoration	$ 8,103,600	$ 650,254	$ 50,000	$ 977,238	$ 977,905	$ 978,579	$ 979,259	$ 979,947	$ 980,641	$ 981,342	$ 982,051
19	OCI Phase 2	$ 47,945,500	$ 3,847,271	$ 274,100	$ 6,313,590	$ 6,317,248	$ 6,320,943	$ 6,324,674	$ 6,328,443	$ 6,332,249	$ 6,336,094	$ 6,339,976
20	WPCS Storage Phase 2 (20 MG)	$ 25,450,000	$ 2,042,174	$ 215,600	$ 3,382,973	$ 3,385,850	$ 3,388,756	$ 3,391,691	$ 3,394,656	$ 3,397,650	$ 3,400,674	$ 3,403,728
21	WPCS Storage Phase 2a	$ 10,277,100	$ 824,661	$ 88,000	$ 1,443,852	$ 1,445,026	$ 1,446,212	$ 1,447,410	$ 1,448,620	$ 1,449,842	$ 1,451,077	$ 1,452,323
22	WPCS Disinfection	$ 12,600,000	$ 1,011,057	$ 55,300	$ 1,636,871	$ 1,637,609	$ 1,638,354	$ 1,639,107	$ 1,639,868	$ 1,640,635	$ 1,641,411	$ 1,642,194
23	Rack 14 Storage Basin	$ 1,984,800	$ 159,265	$ 34,500	$ 297,186	$ 297,646	$ 298,111	$ 298,581	$ 299,055	$ 299,535	$ 300,018	$ 300,507
24	Rack 15 Storage Basin	$ 1,651,200	$ 132,497	$ 28,600	$ 251,279	$ 251,661	$ 252,046	$ 252,436	$ 252,828	$ 253,226	$ 253,627	$ 254,032
25	Rack 3 Treatment Basin	$ 1,700,100	$ 136,420	$ 76,600	$ 321,647	$ 322,889	$ 323,701	$ 324,744	$ 325,797	$ 326,861	$ 327,935	$ 329,021
26	Rack 12 Treatment Basin	$ 2,201,400	$ 176,646	$ 170,000	$ 516,672	$ 518,941	$ 521,232	$ 523,546	$ 525,884	$ 528,245	$ 530,629	$ 533,037
27	North Side Tunnel	$ 28,371,900	$ 2,276,635	$ 172,000	$ 3,964,595	$ 3,966,690	$ 3,969,209	$ 3,971,550	$ 3,973,915	$ 3,976,304	$ 3,978,716	$ 3,981,153
28	Post Construction Monitoring	$ 91,500	$ -	$ -								
29	Rack 8 Separation	$ 2,326,400	$ 186,676	$ 4,600	$ 318,526	$ 318,598	$ 318,650	$ 318,712	$ 318,776	$ 318,839	$ 318,904	$ 318,969
30	Rack 30 Separation	$ 7,574,000	$ 607,757	$ 6,900	$ 1,046,581	$ 1,046,673	$ 1,046,766	$ 1,046,860	$ 1,046,955	$ 1,047,051	$ 1,047,147	$ 1,047,245
31	Rack 36 Storage Basin	$ 992,800	$ 79,665	$ 20,000	$ 165,368	$ 165,655	$ 165,925	$ 166,197	$ 166,472	$ 166,750	$ 167,030	$ 167,314
32	Rack 10/11 Treatment Basin	$ 3,723,600	$ 298,791	$ 80,300	Construction	$ 649,451	$ 650,534	$ 651,627	$ 652,731	$ 653,846	$ 654,972	$ 656,110
33	Rack 40/31-NS Tunnel Phase 3	$ 12,325,100	$ 989,078	$ 117,700	Construction	$ 1,950,220	$ 1,951,806	$ 1,953,409	$ 1,955,027	$ 1,956,661	$ 1,958,312	$ 1,959,980
34	Rack 7/5 Storage Basin	$ 1,672,800	$ 134,230	$ 16,900	Preliminary	Design	Construction	$ 276,948	$ 279,208	$ 279,470	$ 279,735	$ 280,003
35	Rack 22 Storage Basin	$ 1,283,000	$ 102,951	$ 29,200		Preliminary	Design	Construction	$ 190,530	$ 190,936	$ 191,345	$ 191,759
36	Rack 25 Separation	$ 2,974,500	$ 238,682	$ 8,300			Preliminary	Design	Construction	$ 366,310	$ 366,426	$ 366,544
37	Rack 13 Separation	$ 4,328,200	$ 347,306	$ 7,200				Preliminary	Design	Construction	$ 536,800	$ 536,701
38	Rack 21 Separation	$ 2,199,500	$ 176,494	$ 10,400					Preliminary	Design	Construction	$ 287,735
39	Rack 29/27 Treatment Basin	$ 1,934,100	$ 155,197	$ 104,000					Preliminary	Design	Construction	$ 316,505
40	Inflow Elimination				$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000	$ 400,000
41	Nine Minimum Controls				$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000
42	Miscellaneous Separations	$ 200,000			$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
43												
44	Totals	$ 340,253,500	$ 27,119,507	$ 36,846,600	$ 82,514,664	$ 85,332,873	$ 83,270,148	$ 84,030,321	$ 83,640,362	$ 82,989,814	$ 84,023,012	$ 85,120,998
45												
46	Projected 2002 Revenue			$ 33,800,000								
47	Projected Revenue [Existing Revenue x % Rate Increase]				$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029
	% Rate Increase Needed				0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
48												
49	Subtotals			$ 33,800,000	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029
50												
51	Totals				$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029	$ 83,960,029
52												
53	Ending Balance				$ 7,757,843	$ 6,384,999	$ 7,074,881	$ 7,004,589	$ 7,324,257	$ 8,294,472	$ 8,231,490	$ 7,062,522
54												
55	Monthly Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)			27.94	$ 69.42	$ 69.42	$ 69.42	$ 69.42	$ 69.42	$ 69.42	$ 69.42	$ 69.42
56	Annual Sewer Charge for Typical Akron Residential Customer (1,000 cu. ft./mo.)				$ 833.04	$ 833.04	$ 833.04	$ 833.04	$ 833.04	$ 833.04	$ 833.04	$ 833.04

Notes:
1. Capital Costs include preliminary engineering, design engineering, construction, construction inspection, construction engineering, and interest on bond anticipation notes.
2. Capital Costs are in 1998 dollars and are inflated at a rate of 2% per year to the year during which construction begins.
3. O&M Costs are in 1998 dollars and are inflated at a rate of 1% per year.
4. Debt Service is computed at 5% for 20 years.

6.0 PUBLIC PARTICIPATION

6.1 Introduction

The CSO Control Policy requires a public participation program for all long-term control plans. The scope of the public participation program is dependent on the impact that the long-term control plan will have on the surrounding area; the larger the community, the larger the scope of the public participation program. The public participation program for Long-Term Control Plan '98 consists of four parts: a technical advisory group, public meetings, public hearings, and public information distribution.

6.2 Technical Advisory Group

The Technical Advisory Group (TAG) for Long-Term Control Plan '98 consists of a cross-section of people in the planning area. The individuals that serve on this group are from local industries, municipalities, environmental groups, regulatory agencies, parks, associations, and councils. Personnel from the City of Akron Engineering Bureau and Public Utilities Bureau are involved with the group, serving as spokesmen for the City, and addressing questions on the progress of the project and its direction. Other members of the group are from the following organizations:

- A. Schulman, Inc.;
- BF Goodrich Company Chemical Group;
- Cascade Locks Park Association;
- City of Akron City Council
- City of Cuyahoga Falls;
- City of Fairlawn;
- City of Tallmadge;
- Cuyahoga Valley Communities Council;
- Cuyahoga Valley National Recreation Area;
- Friends of the Crooked River;
- GenCorp;
- Goodyear;

- Little Cuyahoga River Conservancy;
- MetroParks Serving Summit County;
- Ohio & Erie Canal Corridor Coalition;
- Ohio Environmental Protection Agency; and
- Village of Lakemore.

A total of nine meetings have been held, starting in February of 1998. The last meeting was held in January of 2000, with additional meetings planned for the future, but not yet scheduled. The topics covered at these meetings included the following:

- Project History;
- Hydraulic and Water Quality Modeling;
- Collection System and WPCS Alternatives;
- Impacts of CSOs on Existing Water Quality Conditions;
- Impacts of Alternatives on Water Quality Conditions;
- Non-Traditional Stream Restoration Alternatives;
- Floatables Control Technology;
- Cost Information on the Ultimate Integrated Plans;
- Evaluation of Ultimate Integrated Plans; and
- Selection and Rate Impacts of the Selected Ultimate Integrated Plan.

Table 6-1 presents a summary of the dates and topics for all nine of the TAG meetings.

Table 6-1
Technical Advisory Group Meeting Summary

Tag Meeting	Date	Agenda
No. 1	2-19-98	Introduction Purpose of Technical Advisory Group History and Background of Project Scope of Current Project Akron Facilities Planing Area Akron Sewer Service Area Akron Combined Sewer Service Area Water Quality Alternatives to be Investigated Future Meeting Schedule
No. 2	4-2-98	Water Quality Stream Use Designations Chemistry Collection System Alternatives Complete Separation Express Sewers Ohio Canal Interceptor Rack 40/Parallel Outfall Sewer North Side Interceptor Detention Basins (End-of-Pipe) Infiltration-Inflow Reduction Floatable Controls for Selected CSOs Non-Traditional Alternatives Cost-Benefit Analysis
No. 3	5-14-98	Existing Water Quality Conditions Cost Estimates Water Quality Impacts Non-Traditional Alternatives Cost-Benefit Analysis
No. 4	6-25-98	WQ Impacts - Express Sewers WQ Impacts - Ohio Canal Tunnel WQ Impacts - Rack 40/Parallel Outfall WQ Impacts - North Side Interceptor CSO Rack Rankings by Hydraulic Measures

Table 6-1 (Continued)
Technical Advisory Group Meeting Summary

Tag Meeting	Date	Agenda
No. 5	8-6-98	Water Pollution Control Station Alternatives Alternative Evaluation Criteria
No. 6	9-24-98	Non-Traditional Alternatives Floatables Control Technology Ultimate Integrated Plan Alternatives
No. 7	10-29-98	Cost Estimates of Ultimate Integrated Plan Alternatives Selection of Ultimate Integrated Plan
No. 8	1-21-99	Review and Update Non-Traditional Alternatives Selected Integrated Plan
No. 9	1-26-00	Review of Integrated Plan 2 Submittal to OEPA City of Akron Future Course of Action Cuyahoga American Heritage River Presentation

6.3 Public Meetings

A public meeting was held on March 26, 1998 at 7:30 PM at the Oliver Ocasek State Office Tower in downtown Akron. This meeting presented information on the scope of the project, reasons the project is required, and the future schedule.

The objective of the public meeting was to provide attendees with a general understanding of the City of Akron's CSO situation. The agenda for the public meeting included the following:

- Introduction;
- Background;
- Water Quality;
- Alternatives;
- Schedule; and
- Public Comments.

Attendees at the public meeting received a map showing the Regional Planning Area Districts, a listing of reference documents, a description of previous CSO control work, and a summarization of the CSO regulatory framework.

6.4 Public Hearings

A public hearing has not yet been held. At the appropriate time, a public hearing will be conducted to provide the public a chance to voice their opinions, for the record, of the Long-Term Control Plan '98.

6.5 Public Information Distribution

As a less formal means of providing information to the public concerning the CSOs and the long-term control plan, the City of Akron has developed and posted a CSO section on the City's Internet web site. The public can learn about the CSOs, including the details of their operation and their locations, as well as reviewing information about controlling CSOs. The City plans to update the web site periodically as the implementation of Long-Term Control Plan '98 progresses.

7.0 REFERENCE DOCUMENTS

7.1 Long-Term Control Plan '98 Reference Documents

The following is a list of reference documents that were used in developing and completing the Long-Term Control Plan '98. With prior notification they can be made available for viewing.

1. NPDES Permit Number 3PF00000*GD, issued by Ohio EPA to the City of Akron on September 30, 1994, effective on November 1, 1994, expires on April 1, 1998.
2. Ohio EPA Director's Findings and Orders, issued to the City of Akron on August 5, 1994, effective on September 20, 1994.
3. *U.S. EPA Combined Sewer Overflow (CSO) Control Policy*, April, 1994.
4. *State of Ohio Combined Sewer Overflow Strategy*, Ohio Environmental Protection Agency, Division of Surface Water, March, 1995.
5. *Combined Sewer Overflows - Guidance for Nine Minimum Controls*, U.S. EPA, Office of Water, May, 1995.
6. *Combined Sewer Overflows - Guidance for Long-Term Control Plan*, U.S. EPA, Office of Water, September, 1995.
7. *Combined Sewer Overflows - Guidance for Financial Capability Assessment and Schedule Development*, U.S. EPA, Office of Water, March, 1997.
8. *City of Akron Facilities Plan*, 1980.
9. *City of Akron Ohio Canal Combined Sewer Overflow Study - Phase I*, 1993.
10. *City of Akron Ohio Canal Combined Sewer Overflow Study - Phase II*, 1994.
11. *City of Akron Cuyahoga and Little Cuyahoga Rivers Combined Sewer Overflow Study*, 1994.
12. *City of Akron Combined Sewer Overflow System Wide Study - Phase I*, 1995.
13. *City of Akron Nine Minimum Controls Documents for the Combined Sewer System*, 1995.
14. *City of Akron Operation and Maintenance Manual for the Combined Sewer System*, 1995.
15. *City of Akron Combined Sewer Overflow System Wide Study - Phase II*, 1997.

7.2 Facilities Plan '98 Reference Documents

The following documents were prepared as part of the Facilities Plan '98 project, and were used in the preparation of this summary document. These are also available for review with prior notification.

1. *City of Akron Facilities Plan '98*, December 15, 1998.
2. *City of Akron Facilities Plan '98 - Alternatives* - April 30, 1999.
3. *City of Akron Facilities Plan '98 - Appendices* - April 30, 1999.
4. *City of Akron Facilities Plan '98 - Flow Monitoring Supplement, Volume 1 of 2*, February, 1998.
5. *City of Akron Facilities Plan '98 - Flow Monitoring Supplement, Volume 2 of 2*, February, 1998.
6. *City of Akron Facilities Plan '98 - Sampling, Flow Monitoring, and Analysis*, March, 1998.
7. *Complete Separation Alternatives, Project Memorandum*, February 19, 1998.
8. *Akron Water Pollution Control Station, Secondary Routing Impact Study*, March 1998.
9. *Northside Interceptor (NSI) Alternative Analysis, Project Memorandum*, April 21, 1998.
10. *Ohio Canal Tunnel Alternative Analysis, Project Memorandum*, April 21, 1998.
11. *Express Sewer Alternative Analysis, Project Memorandum*, April 21, 1998.
12. *Rack 40 Alternative Analysis, Project Memorandum*, April 21, 1998.
13. *Detention Basins Alternative, Project Memorandum*, April 24, 1998.
14. *Comparison of Biological Sampling to Water Quality Model, Technical Memorandum*, April 28, 1998.
15. *Water Quality Modeling, Existing System Conditions, Technical Memorandum*, April 1998.
16. *A Phase I Literature Review for the Proposed Akron CSO Alternative in the City of Akron and Northampton Township, Summit County, Ohio*, May 8, 1998.
17. *Express Sewer Alternative - Water Quality Impacts, Technical Memorandum*, Inc., May 29, 1998.
18. *Sewer Separation Alternative - Water Quality Impacts, Technical Memorandum*, May 29, 1998.

19. *Rack 40/Parallel Main Outfall Interceptor Alternative - Water Quality Impacts, Technical Memorandum*, May 29, 1998.

20. *Ohio Canal Tunnel Alternative - Water Quality Impacts, Technical Memorandum*, June 12, 1998.

21. *Comparison of Ohio EPA and City of Akron Biological Sampling Results, Technical Memorandum*, June 23, 1998.

22. *Northside Interceptor Alternative - Water Quality Impacts, Technical Memorandum*, June 23, 1998.

23. *Sediment Sampling and Analysis, Technical Memorandum*, 1998.